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MINUTES OF THE

MOBILITY AIDS EVALUATION CONFERENCE

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SENSORY AIDS EVALUATION AND DEVELOPMENT CENTER

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John Dupress:

The first item on the agenda is to go through the previous evaluations. Historically, the first one is the work done at the Haskins Laboratories at the end of World War II. The second is the work done by Professor Benham and his associates around 1950. The third one is the work done by Leonard and Carpenter in their first go-around on the Kay-Ultra device. The fourth is the TRACOR evaluation. The fifth in the series can be called the field testing, over time, of the device you have, Tom.

Since there are people here who know more about the Evaluations than I, I'll just indicate what I think are the common aspects.

Each of the evaluations has tried to incorporate some of out in the field testing which is compartment two. To a certain degree, this involves what might be called real life situations. Compartment one emphasizes laboratory controlled testing. The Haskins was primarily, but not exclusively, a laboratory control situation. In a sense, here is an internal maze where you're trying to determine the ability of a blind person to navigate through the maze using a detector, but without a cane or dog. To a certain extent the other evaluations have involved this, except the one you, _____, did in 1950. Here, the emphasis was on real life situations out in the field. There is, of course, much to be said for both types of evaluations. If you are trying to establish correct training procedures, and determine the ability of people to operate under limited conditions which can measure fairly carefully, there is much to be said for a training program in which you introduce a controlled experimental maze, or at least an object detector, without navigation procedure. This still doesn't tell you how a person is going to operate with all the variables. It certainly doesn't tell you how the individual is going to operate, if this device is a supplement to his distance, capability rather than a substitute for or a device that enables one to acquire capability. Under these conditions, it doesn't seem, at the present time, that we know how to simulate this in the laboratory in enough detail, with enough complexity and real weighing of the variables, so that you find out what's going on.

The net results of all these evaluations is that each device was judged as not being better than, or equal

to, the cane or the dog. The second conclusion reached was that there could have been more and better training, in order that the person could use the device more adequately. The third conclusion was that the selection of subject was a very important aspect, in terms of final achievement. The fourth conclusion was that, in real life situation, most people didn't take over the device as being a thorough solution for them. Along with this, there wasn't any absolute certainty that the kind of questions asked were the right ones, in terms of the usefulness of the device. The net result of all the evaluations so far is that the devices have been rejected by nearly all the blind subjects. In the cases where they were accepted, we know we have enough data to say that this device is worthwhile.

In reviewing the evaluations, my personal opinion is that had they had more time, more staff, more budget, at least there could have been advances in both training and in the redesign or implementation by slight changes in the devices, so that they could have been more useful. I don't really think we know very adequately how well any of the devices could really supplement anybody's mobility on under conditions. We could say, well this gives the real merit of the device. This may seem like a charitable conclusion to reach, but I don't think it is. It is an honest conclusion.

So, the purpose of the meeting today is going in the direction of more adequate evaluation procedures, and to benefit from the experience of people who have had more field testing experience and not just in controlled laboratory experiments.

Howard, do you want to review the TRACOR evaluation?

Howard Freiberger:

All right, I'll try, and I'll try to do it this way. I read the large report that TRACOR made and it's packed full of information. I read it when we first got it, and I read it more recently, and I still find it reasonably hard to put the thing into a good summary, there are so many variables and so many parameters involved, and certain changes in the experimental procedures as they went through. Professor Worchel, who was deeply involved in the thing, is currently planning to publish a paper on that particular evaluation in the Journal of Applied Psychology. We received an early draft of the paper in March of this year, so the paper is possibly just being

published now, or maybe it had been published. I've been looking and haven;t seen it yet. This paper starts with a summary which, if you will bear with me, I shall read it. It's only a one page summary, and I think this puts into a nutshell, perhaps better than I could, what that evaluation was about.

> "This investigation was an attempt to evaluate the effectiveness of and electronic obstacle detecting device for the blind. The subjects were 26 totally blind individuals. Three series of training sessions on the obstacle detector were conducted. Performance was assessed in one pre-training session with the customary mode of travel, and three post-training sessions with the obstacle detector. Subjects were also given the Wexler Adult Intelligence Series Vocabulary Test, The California Psychological Inventory, The Emotional Factors Inventory, and two interviews dealing with their reactions to the instrument. Using the obstacle detector on the standard obstacle course, subjects took about three times longer to walk down the course than with their customary aid. Errors with and without the obstacle detector were about the same. Analysis of errors and time, according to mobility aid, showed that subjects who walked unassisted made many fewer errors with obstacle detector than without it. For those subjects using a cane or a dog, the obstacle detector was of little help and probably was even a hinderance. After considerably more training on the use of obstacle detector, the subjects reduced the time to walk the obstacle course, when instructed to proceed as rapidly as possible, while errors remained about the same. On the field test, subjects made fewer errors but took somewhat longer, with the customary mode of travel, than with the obstacle detector.
>
> About one-half of the subjects indicated a desire to own the obstacle detector. Those who used guide dogs, were the most positive. Those who travel unassisted, even though apparently they were helped the most, were the most negative, and cane users fell in between."

Now, that's his summary for that report. I made some abstracting notes of my own, which I'll read for you.

As he pointed out, 26 subjects started in the series. He's listed them A to Z, so you can easily remember how many were involved at the start. However, as the investigation progressed, in fact only 19 were on board for most of the evaluation procedures. Only 14 were there for every phase of the thing, less the final interview, for which only 11 were there. It almost seems as though the last and now there will be none. Actually, probably nobody uses it too much in daily use, at the moment, and routine daily use, although Tom Benham may have information about that. There are only 5 or so in existence. But, I think this is something we find again and again, that subject participation is always a difficult variable. It cuts through evaluation procedures, if it isn't considered beforehand. You start off nicely and neatly and make all your selections and you get 26 suitable subjects. Then, when you make your final analysis, they've dropped out of different elements of your results and you must analyse with some sort of multiple adjustment, and find only eleven were really there throughout. There are always things happening, so a prudent investigator would be careful about what he hopes to get at the end, in terms of numbers of subjects and what he starts with and how he gets the subjects, and where they come from, and whether they are paid or not, if they are volunteers, and how they may be motivated, etc. John Dupress is always pointing this out. There is also not an inexhaustible supply of subjects, so the human fibre seems to be just a little bit different than electronic components stored in bins, where you can order 100% at a reasonable cost. It seems very difficult to do that, with this aspect of these evaluations; the human factor.

There were three series of training sessions as mentioned in that summary, and they were, briefly, a stationery phase where the subject stood in a spot and explored with the device, perhaps in a 360° periphery, and the person was trained by the instructors to pick up obstacles in this way, asked to describe where they were in azimuth and possibly their azimuthal extent, and so on.

The second series involved a simple travel situation which was on a test course with selected obstacles, and some have said this wasn't so simple, either. Yet, people had learning involved in this, and learned pretty quickly, but I think there were 6 or 7 obstacles placed in an 85 foot runway, so to speak. There have been points of view, as to whether this is simple or difficult. His third type of training situation was called a complex travel situation, and this was done

on a city street, actually, and unfamiliar street. Then, having trained people in these ways, four series of test trials were conducted, and it is because of these multiple tests that I think it's hard for me to quite compartmentalize just what really was done and came out of the thing, because there were both varieties of trainings and of testing situations. But the four series of test trials involved a pre-training performance test using the customary mode of travel. He attempted to, as a Psychologist would, obtain a base line of performance before any of this new equipment was brought into play. Then there was a post-training performance test using the obstacle detector. However, the customary mode of travel was discarded, at the moment, and only the obstacle detector was used; clear-cut direct procedure, if you would want to evaluate B against A. This has raised question and doubt on the part of many, as to whether this device should have been used as a supplement or entirely on its own. Maybe Tom Benham would comment a little bit about whether it's a complete aid. Maybe it's complete in certain circumstances, but not in others. At any rate, this evaluation established a base line in the customary mode and then went ahead and tried to measure what this thing did by itself, as a replacement of the customary. Both these pre- and post-training tests were done on indoor and outdoor courses: similar runways with obstacles placed in them, but one indoors and one outdoors.

The third test was a field performance one and unfamiliar city block, in which only 14 of the 26 (you see, that reduction had already occurred) participated. The fourth test came about (probably as afterthought, and our considerations of what had gone before) in which the subjects were instructed to walk through the course as rapidly as possible. Whereas, not having this instruction, these big times came up and they seemed to be very slow at their task. Only 11 persons remained for the fast test. In fact, on instructions to go fast, they did go fast and didn't make anymore errors. Well through the test, near the end, we were faced with this slight shift in things, and it was finally concluded that in earlier phases, instead of merely navigating and travelling, they were doing certain investigation and the device was bringing in some concept of their environment, possibly, or it was a novelty. They were doing something with it and Professor Worchell thinks just investigating their environment, and this slowed them down. So, on instructions to walk fast and knock off some of that random, or just voluntary scanning, more than was necessary really for safety and progress, they did go faster and didn't make many more

errors. The whole investigation, then, involved these training and testing series, and a long string of conclusions was arrived at, which I won't go through, but they appear in the report. They've just found going faster and going slower (the dog users, naturally, go the fastest) people who use no aid are the slowest, and cane users are in between. This device slowed down most people, as was pointed out, and subjects liked it. Some thought it was too heavy, and a variety of such subjective comments were made. We still have copies of this report which I would be glad to furnish, and Professor Worchell's up-coming report should be widely available, if published, and this of course I don't know yet, in the Journal of Applied Psychology, as I've said. Anyone who cares to have the old report would best leave their name, and I'll have to send them.

John Dupress:

Any questions, comments?

_____:

Did they do anything with the intelligence test and the personality inventories?

Howard Freiberger:

Yes, they attempted to work out a scheme to enable them to predict, on the basis of giving persons such tests, those who would most likely use this instrument well. It says, a bold person and one that does this is likely to use it better than a retiring person; that you know all the varying dimensions in the psychological inventories. He's figured out correlations between the quality of the performance and those things. The dimensions are as follows: "those who did well with their traditional mode of travel aid tended to be more retiring and inhibited, more awkward and conventional, more deliberate and moderate, more immature and lazy, more defensive and demanding, more suspicious and aloof, more anxious and cautious, more easy going and unambitious. Those who did well with their traditional mode: distrustful of others and to have greater feelings of inadequacy and inferiority than those subjects who made relatively more errors with their traditional mode."

_____:

If he counted the number of errors they made, that might be true, but if he covered adequate travel

performance in some way.....

Howard Freiberger:

No, you have no way to do that, really. It's his error measures in time. He came to a figure of merit, no doubt, of performance with this device, which he corelated with these nicely laid out psychological inventories. At the time, I thought he shouldn't probe the subject that deeply. I thought he would get them all angry and they'd say the ____ with this. I thought it was too probing for this kind of an investigation, but perhaps not. I'm not a Psychologist and I thought just nuturing them along and trying to get them to use the instrument at its best, rather than sort of raising their skirts so high, would have been a better way to do it. I can't see that they have validity. If you figured out whether they had validity, perhaps they wouldn't either, from just psychologival statistics. How could 11 persons really tell? You know, 50 personality elements from 11 people, and say it means anything.

Jim Swail:

There is one thing I thought I'd make a comment on. Howard, initially I think you said in your summary that the people who used no aid were at the bottom of the list of those who would want to continue to use it. I think this is obvious, because those who don't use anything, don't use anything because they think they are more conspicuous with something and it doesn't matter what you give them. I think that this really shouldn't be taken into account. They should have been tested, but maybe they should be weighted in this way.

Howard Freiberger:

Or maybe they just don't want any aid.

Jim Swail:

Well, this is it. They don't want any aid because they think they look more obvious with it. But, they look much more obvious without it, really, because of the way they travel.

Howard Freiberger:

I was thinking in matters of pride, maybe, a slightly different element. They get around anyway.

Jim Swail:

Well, some of them do and a lot of them don't. The point is, that this has to be taken into account. You just can't make the statement and then leave it hanging.

Prof Lukoff:

Well, I would raise one point. The fact that there is this heirarchy, in terms of response to the combined dog guide users, then caneusers, then the users without aid, ~~there~~ they are predispositioned, because in any study of these groups in population, statistically, you can discriminate them on a whole host of measures. They tend to be somewhat selective than those who move in different modes of travel and they are just the opposite of the kinds of things you read, by the way, on the whole. Dog guide users generally tend to be more agressive and out-going, and somewhat higher intelligence than the average cane user, who is then a little better off then those who use no aids at all. Either, he might have made a mistake in his correlations or, because the criterion is so unique (it's so different than the real-life travel situation), I think that latter possibility is probably it. This raises a whole problem of experimental evaluation as you attempt to project this into real-life situations. Sometimes your attempt to get simple manageable criterion measures results in measures that are of so little relationship to the real-life situation in this particular instance. If you simply managed to get information somewhere or other about their general travel facilities. I think there is enough information to indicate that the results would be somewhat reverse from the ones you have here.

Howard Freiberger:

Well, unfortunately, when I looked into this just to find these elements, I read the second half which maybe is less interesting than the first half. I mentioned those who did well with their traditional mode of travel. What I should have looked at, "those subjects who made the fewest errors in traveling the course using the obstacle detector tended to be more outspoken and sharp-witted, more planful and responsible, more capable and cooperative, less neurotic and less ~~un~~emotionally unstable, to have fewer somatic symptoms, to feel more socially competent, and to have fewer feelings of inadequacy and inferiority than those individuals who made the most errors in using the device."

So this is sort of the other side of that coin. They're just more capable people. That's what it seems to say.

John Dupress:

Any more questions or comments?

Mr. Meldelson:

Yes, I wonder if I might get clarification of a point that was made in the summary which you read initially. At each stage of the progress, you seem to get a ccnsistent finding that those who did well with the obstacle means of mobility didn't do too well with the obstacle detector. Until you get out into the field trials, it seemed to be the reverse. Did I hear that incorrectly?

Howard Freiberger:

I don't think exactly that came out. It seemed to be more of a quantitative shift in that direction. In other words, a good user of a dog guide, someone who maybe used it for years, was much better in traversing the course in time, went down much faster and made fewer errors, than someone who had the benefit of our limited training course with the obstacle detector, his dog taken away from him. That's what was found. In other words, people using conventional means, however practiced, which we didn't go into, they did better with their conventional means than with this device. I think that's what was indicated.

Mr. Meldelson:

Well, at the end of the summary, I thought there was a reversal of that when you were talking about the field.

Howard Freiberger:

There seemed to be a slight reversal. It says, "On the field tests, subjects made fewer errcrs, but took somewhat longer with the customary mode of travel than with the _____." I can't explain just why that was.

John Dupress:

Any more questions or comments?

Tom, maybe you'd like to say a few well chosen words about this?

Professor Benham:

Well, I think for the benefit of those here who don't know the history of what I've been doing, it might be well to start back at the begining, just for a minute.

When the Signal Corps device was built in 1948 by RCA, it was decided to give it some tests. I advocated at the time that we give it a field test, rather than a laboratory test, because it always has seemed to me that the instrument is ultimately to be used in the field and, therefore, it would be well to find out how it behaves, how people feel about it under those conditions. I guess the other reason why I advocate doing it that way is because I don't feel competent to make a laboratory test of it. I'll leave that to people who know how to do it. I don't mean to say that I know how to make a field test, either. So, in 1950 we set up a program in which we hired a person to become somewhat familiar with mobility of the blind and she went to Seeing-Eye and a couple of other places to find out what mobility problems were, as understood in those days, and then she came back to Haverford and we drew up a program for putting the RCA version of the Signal Corps instrument into the hands of some subjects that we picked from the blind population of Philadelphia. She went around with these subjects and trained them in the use of the instrument, and followed them around on the street to see how they used it. After they had been trained for a couple of weeks this way (one hour a day or so), the instrument was given to them to use in their "every day life". She went around and checked-up on them every once in a while. Sometimes, she found out what their pattern of travel was to get to work, and she would appear at the same street car stop that the blind person appeared at to board the car, and followed them unobtrusively to see what they did.

The results of that test were written up in a report that came out in 1952 (the VA has it) and I guess they still can give you a copy of it if anyone wants it.

The consensus of the report is, I think, that the principle of an obstacle detector was a good one. The method used in the Signal Corps device, which was optical triangulation, was all right. Also, further development should be undertaken to overcome a number of difficulties that appeared. I don't think that I want to go through what those were at this moment. We can talk about them later if anyone wants to ask questions about them. As a result of that, the Veteran's Administration started a series of contracts with Bionic Instruments to develop a guidance optical detector, in fact a guidance device, that would meet the objections that were found in this test.

One of the things that the Signal Corps device was supposed to do was to detect curbs, but it was such a difficult proposition that we decided to break it into two parts and go along in investigations along the lines of finding curbs with one line of investigation and just detecting obstacles with another. The curb problem is a very, very difficult one that isn't solved yet, although there are methods afoot that we think will solve it, if we can get the money to go ahead on a high enough technical level to be able to hire the people required to work on it. It's a really tough one. The obstacle detector isn't so bad. Over a period of time, we've built a number of them. We finally ended up with what we call a G5 which was the one that was tested in the TRACOR Program that Howard just outlined. That instrument, for those who haven't seen it, weighs a little bit under two pounds and measures approximately 3-1/2" wide by 7" long and 7' high. It has a handle on the top (the 7 inches high includes the handle), which you take a hold of and, when you drive it, there's a little trigger-like device that you put your index finger in and, when an obstacle is encountered, a stimulator sends a signal down to your finger.

After the TRACOR testing, I argued again that we ought to try it on a field test. So, the Veterans Administration gave me permission to go ahead on an informal evaluation in the field. Now, actually, what I'm trying to do is not come up with a scientific approach to finding out what people think of the instrument, but rather a consensus of opinion. As I facetiously put it, if we waited for the automobile until we had the exact psychological response that everyone was going to have to it, we wouldn't have it yet. So, I wanted to find out what people would think of this thing, if you just give it to them and let them play with it. So, I made up a set of instructions, recorded on tape, describing the instrument and how to use it, and how to go about learning how to use it, what procedure to use to get to the point where

you can take it out on the street and try it. Then I asked for volunteers, people who would be willing to play with it, and send in reports from time to time on what they found. We got a tremendous number of volunteers. So many, that we couldn't begin to use them all. So, I just started at the top of the list and sort of randomly sent the instruments out to people that had volunteered. The only criterion that I set was that the person be totally blind. I sent them the instructions and then sent them the instrument and waited to see what would happen. I got all kinds of replies. I just gave Howard an informal preliminary report of what the reactions have been and, since it's VA property (the report), I'll leave it to him to decide whether he wants to distribute any of them here, or distribute them by mail later, after he's had time to digest it, because I just wrote it yesterday, and he hasn't had a chance to read it yet.

Howard Freiberger:

Well, I'll tell you. I have only 9 copies and it has 12 pages. Now, if it makes no comments which would embarrass the U.S. Government, I don't see why we can't distribute the 8 or 9 _____ 10 copies.

Professor Benham:

Well, that's up to Howard. Maybe he could read it and give you a digest of it, after lunch.

What I'm after, as I said, is a consensus of opinion which means that what I'm doing is sitting here, absorbing these comments and coming to a conclusion as to what we ought to do, what the instrument is capable of, and what we ought to do next, so that it's going to be a subjective consensus of opinion.

Jim Swail had one of the instruments, so you can quiz him narrowly, if he's willing, on his reaction to it, in addition to whatever I have to say about it.

Oh, by the way, what I intend to do is to make up a questionnaire and send it to each of the people that had one of the instruments, and ask them to answer the questions as honestly as they can and, from those answers, draw some more conclusions on a consensus basis not a statistical basis.

So far, the consensus is that the instrument is too heavy and too large. Here lies a serious problem, because one of the reasons why Bionic Instruments has not come up with a suitable obstacle detector is that every time we make one, the state of the art is sufficiently better, at this point, that we could make a better one. So, nobody will accept the one we've made. Eventually, what we're going to have to do is to come to a conclusion that this is the device that we're going to make available, and then go ahead and make it available, because if you don't, you'll never get anything. The state of the art is always improving, and you can always make a better one, and there are always going to be criticisms, no matter what one you put on the market or make available. Eventually, somebody is going to say, well, this is it, gentlemen. This is going out, and we'll wait a few years and then we'll make a better one. That's the reason why people find it too heavy and too big. It isn't very big and it isn't very heavy, but, compared with pocket-sized radios, they all say, - you've got transistors now, why can't you make it about the size of a pack of cigarettes? If you put the major part of it in your pocket, you can. That's what some people do, and it leads you to think that you've got a big improvement, because what you carry in your hand now is a little thing about the size of a flashlight, but what's in your pocket tears out the lining. We're constantly struggling against the philosophy that it could be smaller, lighter and better. Therefore, I don't like it.

Another problem seems to be the stimulator. Now, we've worked on this stimulator for a long time. Our thought has been that the tactile stimulator is better than an oral stimulator. So, we've tried to stick to the tactile stimulator, but the ultrosonic device of Dr. Kay has gone back to the auditory presentation and I think it's a good thing that he did, because now maybe you will find out whether people really like the oral better than the tactile, or vice versa. If we establish that the oral is better, fine. I'm still of the opinion that tactile is preferable, if you can do it. Making a tactile stimulator that is very good, without consuming an awful lot of energy, turns out to be quite another problem.

There were several things in the design of this instrument that people didn't like, which could be fixed easily in another model without any major efforts. For instance, we didn't provide them adequate means for carrying it when they didn't want to use it. This switch

that goes on when you take a hold of the handle; it's difficult to carry it without the switch being on, which we could correct, of course. The instrument had three ranges: near, medium and far, and you'd switch from range to range by manipulating the controls on the instrument. This seemed to introduce some confusion. People wanted it to range, but they didn't want to have to work at it. So the question is, how do you make one that will give them the same amount of information, without having to make them manipulate controls while they are walking? Also, the range wasn't adequately uniform, from instrument to instrument, so that somebody would get one and the ranging was fine. Then something would go wrong with the instrument, and he'd send it back and we'd send him another one. Low and behold, he didn't like the ranging on this one any more, because it wasn't as good. So, there was difficulty in the manufacturing process in building all of them exactly alike, which of course raises other problems. We discovered this, because we sent different instruments to the same person. Some of them they liked, and some they didn't.

Jim, prod my memory on some of the things that were good and bad about it.

Jim Swail:

Well, I was going to go back to Tom's comment about the device being too large. It is too large, because of what it does, is my feeling. It won't do everything which is the unfortunate point. If it would do everything I wanted it to do in a normal travel day, then it would not be too big, because I would use it continuously. I found that there were a number of situations where I had to go back to more conventional methods, like a cane, and I couldn't carry a cane, and that, and a brief case, and whatever else, all at once. Therefore, I agree with the others who have said that they wanted a smaller device, if it's going to do what the device does presently. For instance, there are not enough gradations in ranging, even with the three ranges provided, to keep things going properly in a very crowded area. Although you can pick out a step-down with it, by very careful use of its ranging, you can't do it accurately enough to be really sure of what's happening in a strange area, and there are a number of other situations. However, for what it did within its limits, I found it very good. In a suburban setting, where I didn't have too much to contend with, simply worrying about children's bicycles left on the street, parked cars, looking for the mail box, etc., I could travel very happily with this thing with no cane. I felt less conspicuous, I think I travelled just as quickly, and I didn't have the benefit of all the Tracor Psychologists, either.

Now downtown, as said before, I felt quite unhappy with the limited ranging. I think Fred Gizone, who also tested it, became somewhat more adept, didn't he Tom?

Professor Benham:

Yes, he did.

Jim Swail:

It doesn't prove that what I'm saying is the end-all. Maybe I didn't do enough, didn't work hard enough, but I spent about 6 months with it. There were many things where it was extremely useful. For instance, you could follow a line-up, if you were getting on a bus or a train, or you wanted to keep your position in the line-up. You can do this very nicely by holding the thing at short range, and I think much more gracefully than poking the person in front of you with a cane. You can walk down an aisle of a bus, as long as there weren't too many people hanging on the rack, or something. But there was just this one objection: when things really got difficult, you couldn't tell someone was 6 feet away or 4 feet away, in a large group, so it was difficult to work your way through the holes in the 5 o'clock traffic. I think this was really the downfall of the one range device, wasn't it Tom?

Professor Benham:

Yes.

A cane wouldn't be any more effective in that kind of a situation would it?

Jim Swail:

Oh yes, certainly. I think you have to accept the fact with a cane, though, that once in a while you touch somebody's foot. It's just unavoidable. Also, a cane is such an obvious thing, that, it appears very awkward, but it might not ____

Tom's approach of the cane from guidance device, which I guess also I'm anticipating things, may be the answer to this type of device. I think one other thing that did bother me with it, right through it and gave

no reflection, unless they were full. If they were well filled with things, then they gave a good reflection.

Professor Benham:

I think then, the consensus also was that you lost physical contact with reality, so that they felt they wanted a cane as well as the device. What we did next was to put the electronics into a cane configuration. That's in the process right now, and we will be finished in another week or so. We started on it in March and it's almost finished, which is pretty rapid progress for a thing like this.

There's just one more small piece to this, then, besides any questions you might want to ask; the objection to its size, for what it did. We tried to make the smallest obstacle detector that we could, and we have the one model here that we made and it's about the size of a flashlight, and it works on the same principle. It sends out a pulse and picks up a reflection off the obstacle. It wieghs 14 ounces, and its battery will last, for continuous operation, something like two hours without recharging. The way in which you normally use it, in going to and from work for instance, is a few minutes now and then, so that it will last a good deal longer than two hours of actual travel time, because you are not using it constantly. We have only tried this instrument on one person, so far.

Malvern Benjamin:

Excuse me, Tom. You better point out that it's non-ranging.

Professor Benham:

I guess I should have done it sooner, thank you. It doesn't have any ranging in it at all. Essentially, it sees from 0 feet out to 10 feet or so, but you can't tell with it where the obstacle is in that range. In order to range with a triangular system, you have to have an appreciable base line that is between the transmiting element and the receiving element. They can't be right close together. For instance, you've seen these flashlights where the head is at right angles to the handle. Well, if you made one like that and put a head at each end, at right angles to the handle, so that it looked out, and you held the thing horizontally, you could do something with it. Yes, we could range with a thing

like that, but the problems are numerous, and we haven't found a way to solve them. They are physiological problems, rather than technical problems. It is difficult to hold it in your hand properly and it is difficult to keep one lens from getting covered up by a girl's skirt, or your overcoat, or something like that.

You have to have a base line, in order to use optical triangulation for ranging and, with the small unit that we have here, there is no base line to speak of, so you can't range with it. All right, so we gave the thing to Fred Gisone, who was one of our best evaluators, because he was able to make the most use of the G-5 (the big one) of anybody, as this report that Howard had would indicate. We gave it to him to see what his reaction to it was, and he played with it for a little while and sent it back and said, "Phooey"! "It's nice and small and I can put it in my pocket, but it has no range, so it's no good".

Jim Swail:

Tom, may I ask a question? Why could you not have built the thing in such a way that the receiving lens hinged down? In other words, it locked-up _____.

Professor Benham:

Yes, that's another possibility. That's the next thing we would try in that configuration, if the budget would permit

This little unit, here, is a first try and should be pursued. Probably it can be reduced still further in size than it is now, but I'll reserve any comments as to what we might be able to do in the future until John is ready for such remarks.

Mr. Meldelson:

Does this provide a tactile response as well?

Professor Benham:

Yes.

John Dupress:

Any questions or comments?

Howard Freiberger:

I have one. I'd like to answer the question by Mr. Mendelson regarding the statement in the summary. I've looked again, and I think I have the resolution of the thing. Perhaps it's a fault that it appears in the paper that way. But, the answer to that is, that the more extensive paper, itself, the one that TRACOR read, they point out that after considerably more training on the use of the obstacle detector, the subjects reduced the time to walk the obstacle course significantly, when instructed to proceed as rapidly as possible, while errors remained the same.

Now, on the field tests, this group, on the average, made fewer errors but took somewhat longer with the customary mode of travel than with the obstacle detector.

This is because the time taken to traverse with their customary mode of travel was done at the start, and they weren't instructed to hurry. Then they took people, further with the obstacle detector and that's what caused that disparity, I think. Probably if they compared people operating with the obstacle detector under one instruction late in the game, with an initial datum that was determined without such an instruction. I think that's the resolution of it. The final statement, however, is: again, however, the subjects who normally walk unassisted did far better with the obstacle detector in the field trials - which you'd expect also.

Professor Benham:

I was just going to say that one of the things that I have emphasized in the instructions that we send out on tape is miss the obstacle. Don't identify it, unless necessary. Then I use a humorous little bit that happened, where I just couldn't get a man to scan-and miss. He would scan, find an obstacle, and then stop and investigate. Well, of course, he was curious. But this doesn't increase his speed of travel, it slows him down. He had a new thing in his hand and he was finding out new things about his environment that he didn't know before. He kept doing it and I couldn't make him stop, so I instructed the instructor to walk behind him, and, the next time he did it, to say to him, "Yes, she's a blonde, now go on!" It so happened that the next time he did it, it was a blonde, and it embarrassed him so, that he never did it again.

Mr. Meldelson:

If this is appropriate, I'd like to comment on that particular aspect of it. This is one of the things that's been troubling me, with our own very limited evaluation of the ultrasonic aid. The few trials we've had have elicited the responses that the cane, for example, not only gives information about obstacles, that is in the sense of helping to miss the obstacles or avoid the obstacle, but also gives information about the environment. It tells what the obstacle is, to a certain extent, and there is a happier accommodation to this than with the use of this particular electronic device that we are using, where it is possible to miss the obstacle and not know what it is, which is somewhat disconcerting.

Jim Swail:

I would disagree with that. I think we should talk about that when we get to ultrasonic aid.

John Dupress:

We might just as well go into it now, unless there are any more questions and comments on the previous evaluations. We moved into on-going but now we're moving into on-going evaluations of the ultrasonic aid. Since you started Mr. Meldelson, maybe you would just come up with a few comments with what you found out in your evaluation. I think one of the prime topics on our agenda is to get the flavor of what people have found out with this particular ultra device, which has been distributed in more quantity than the other device, so far. There are twelve organizations in the United States, which have these and are either doing some evaluation or proposed to do some later. We have just a representation and I'm not sure it's a cross-section. We have some of the people here who have done some evaluation and it would be very useful to see what they have come up with, with another quite different kind of device. So, maybe you can trigger this off.

Mr. Meldelson:

I might say, at the outset, that thus far our evaluation has been, as I said earlier very, very limited and totally unscientific. It's been a matter of, "Let's see what the thing is like." We have not involved psychologists, we have preset obstable courses, and we've let a total of four people play with it to see what they can get out of it. We are projecting a more formal type

of evaluation for the future. Thus far, we wanted to find out what kind of an animal this was. The responses to this point have been that it's extremely useful in ranging and in discriminating the existence of obstacles. However, the inability to detect the character of the obstacle was, in all four cases, counted on as disconcerting or distressing. As a matter of fact, in one case, frightening. The other critical comment about it was that none of the four was able to get the hang of detecting changes in the terrain, including curbs. This has been completely baffling, on the part of all four users. This is about the essence of our experimenting.

Mr. Holcomb:

Is this the Leslie Kay ultrasonic device?

Jim Swail:

I have a tape of the thing, John, as you know. When do you want to use it?

John Dupress:

I thought we'd play the tape, after we'd gotten the comments?

Let's see, who else has had some experience with this particular ultrasonic device? I guess you're next, Jim.

Jim Swail:

I started out by buying one as an engineering device, because I was interested it it. We're doing some ultrasonic research on guidance devices and I became so evolved in the evaluation of it that I bought two more. Now I've got three, and our evaluation program hasn't gone too far. However, I've done enough that I think what I have to say is valid. I corresponded a great deal with the Kentucky Group, who unfortunately aren't here, and I think they've done the most. So, if you'll permit me, I'll combine my remarks with what I think they would have said. I've had several hours of tape from them on what they're doing, and the tape we will play is about 75% their results and 25% my own.

The first thing is that it takes rather a long time to get anywhere with it. I think it's going to take probably two months of intensive training for anyone to

become efficient with it. Also, I am fairly convinced that the people who become efficient are those who are fairly bold, and fairly willing to get out and try new things. I am a cane user too, although really not a very good one, just as a note of explanation. I find you can detect step-downs, you can detect shore lines, you can even detect the character of objects. Some of it is on the tape. It takes a great deal of training, because the changes are very subtle. I feel it's very much like completely learning a foreign language. It takes about the same effort and takes about the same audio acuity. My own status with the device, at the moment, is that I can do all these things, but it's still a fair nervous strain and I don't like to do it, if I'm feeling tired. Fred Gisone and some of his pupils have passed through this phase, and now appear to be operating at about the same rate of travel as with a cane, except that they are finding out more about their environment in the process. For instance, one of the things that I have already noticed, that I find very nice, when you walk into a strange store or living room, with a cane, about all you know is the three feet around you. With this thing, you can pretty well find out the geography of the room, and even note what is a sofa, what's a chair, what's a table, within certain limitations. I don't think I'd walk over and sit down without checking. You can get this general feel. While walking along the street you can pick out all the doorways, and even different shapes of doorways with a little care. You can certainly follow the outer edge of the curb, if you want that as your shore line. You can walk through groups of people with no real difficulty at all. With this thing, if you are willing to take the time, you have the complete facility of ranging which I was complaining about that was lacking in the G-5; anything from a foot to 20 feet, for long range use, so that gradations of about 10% range fairly evenly. You can tell the difference in the character of what you are approaching. If you are walking along a concrete pavement, and all of a sudden you realize you are approaching a piece of asphalt or grass, you can recognize this right away. If you expect an overhead obstacle, you can find it, but this is one of the problems that you don't find it unless you have some idea it's likely to be coming up.

Essentially, it seems to me that, with enough training and with the right personality, this device could be an overall travel aid. It won't detect very minor cracks in the sidewalk and steps which might be a nuisance to some people, which the cane will pick up. I think a step has to be about four inches-maybe six.

John Durpess:

What scan pattern can you use, so that you make sure you're covering the terrain change and the object detector is still _____?

Jim Swail:

Well, I find that if you work the thing at about 20° below the horizon, this gives you the terrain and most of the obstacles. However, it's worthwhile, about every second scan, to pull it up above out of the horizontal. I think you have to change this with what you are doing. If you're in the middle of a block, and your in a great crowd of people at 5 o'clock pouring out of an office, and you have it on the horizontal, you know there are no step-down, but you're avoiding people. If you're walking down a street, and you expect a step-down is likely to come up, then you are certainly scanning above 20° below the horizon, so that you pick up both fairly effectively. One very interesting piece of information I just received from Gisone is that he has a 50 year old man, who lost his sight a couple of years ago, who is totally dependent, couldn't use a cane, who is traveling now at a fairly normal walking clip clip with this device. He has even picked up things like sidewalk repair, where there were no fences around it. This is very interesting, because I was pretty well convinced in my own mind, without any confirmation that it might be restricted to people who had a lot of audio training. This is one case. You can't generalize on one person, but it is interesting. As a matter of fact, this man has become so independent, he won't take his wife's arm any more and she wants to throw the thing away. Hel'll walk along with her, but he refuses to put his hand on her. He says, "I'm going to be independent," and that's that.

Mr. Meldelson:

You were able to detect curbs with it?

Jim Swail:

Well, it's on this tape. On the tape, too, is something which needs explanation. My commentary is terrible. It was made from my own notes, and John asked me yesterday, I think it was, to please bring the tape. I built a 40 kilocycle beacon out of a TV transducer to use as a marker for the house, if it's in the middle of a block, and this gives quite a different affect from an obstacle, and I found it rather interesting. We've been working with acoustic beacons, in conjunction of Tom Benham

Science for the Blind. However, these are fine, but they can be a little annoying if it's something you want to leave on for a long time. I wanted to see what would happen with a supersonic beacon and use it in conjunction with this. The effect is rather interesting, so it's on this tape. I think everything else is self-explanatory.

John Meldelson:

One more comment that I should offer, and I'd be curious to know what your observations were on it, is that all four found the need to wear an earphone, matter of fact, two out of the four had an opportunity to just briefly try out the device that's been developed by the Santa Rita technology people, which is a tactile affair, and expressed greater interest in that, because of the fact that it was less distracting.

Jim Swail:

I think that's a little difficult to answer. I am still at the stage where it is distracting. I don't find that it blocks sound from the environment. The people in Kentucky have gone to what they call vented-shell earmold which seems to completly remove any masking problem and makes the thing much more comfortable to wear. I think the nervous strain is a problem of listening to this thing, but this seems to wear off with enough use. I'm just getting to the point where I think I'm going to get over this. Some of Gison's pupils now appear to have gotten over it. After all, it would be distracting, at first, when you're trying to travel the sound cues to talk to someone, but after a while you can do it. This is above what's going on. You're listening to a foreign language in your ear. I think you can learn to live with this, but I don't want to be very dogmatic about it. At the moment, my reaction is favorable.

Professor Benham:

For instance, I know Morse Code pretty well, and I can carry on a conversation with somebody and copy the code at the same time. I'm not consciously copying it, I just know what the code said, when I turn my attention to it again. But, of course, I've been listening to Morse Code for 35 years, so that it would probably take a long time to get used to doing this automatically.

Jim Swail:

I think it will. I think this is the point, that the people should not be given the device for a week, and say what do you think about it. They should be intensively trained for two or three months, and really intensively trained, as well as I thought the Dog Guide people do. I think Peter Campbell can confirm that. You don't go and take a dog for two days, and say do I like a dog, or don't I? You work for a month, and you work hard. Now, this is what's going to have to be done with these things, in order to get a really meaningful result. People really have to be trained intensively.

Howard Freiberger:

My recollection of some of the time scales that the inventor brought forth, Leslie Kay, were much in excess of even the two months you say would be needed with intensive training. I think, that it would be a matter of years, maybe. Immerse a child in these sounds and let him proceed with it, and see after years what would happen. That's my recollection of what he said.

Jim Swail:

I seem to feel that Gisone and I and some of the other people are getting more now than they did at the end of their Winchester College training which took six months.

Howard Freiberger:

It may have taken long, but may be not adequately intensified and properly reacted to, you know.

Professor Benham:

Well, there's quite a difference between playing with an instrument half an hour a day, under supervision, and using it in your every day life to get around with it. There's a different psychological approach to it.

Jim Swail:

I think you have to. As a matter of fact, to learn it I find that what you have to do is to put your cane away somewhere wehre you can't get at it quickly and force yourself to use it and see how you get along. I certainly wouldn't be willing, even though I have one of them with me today, to venture forth in a strange

environment yet, but I'm getting to that. I think that in a few weeks, I will. A few weeks ago, I wouldn't have even tried to get around a strange room, but that's no problem at all. So things are certainly changing.

Mr. Meldelson:

Well, this is just sheer hunch on my part. The psychologists might clobber me on this, but I will suspect that, because this is, as you put it, tantamount to learning to use a new language, functionally, that probably those who get the most utility or benefit out of this particular device will be pretty well up on the intelligence scale.

Jim Swail:

I think so. They will certainly have to be very open-minded which is usually synonomous, isn't it with them? I have a friend who is a very good cane traveller, and I've been using him as a guinea pig for things. I know already enough about his psychology to know he could never learn this thing, because his cane travel experience is too deeply engrained in him. I know lots of other people who, I think, could. I don't think we'll ever find one gadget that will satisfy everyone. Going back to the G-5, this was one beauty of the tactile, that you can learn to use it in two or three hours. Not to maximum efficiency, but you can learn to get around with it, with whatever limitations the device has. This thing takes a fantastic amount of work but, if you're willing to put it in, it appears that it may be rewarding. Also the device needs a lot of refinement. That's another problem.

John Dupress:

I thought we'd discuss that maybe after lunch.

Mr. Mungovan, have you people had any chance to do anything with your two?

Mr. Mungovan:

The English device? No, we never had it.

John Dupress:

Mrs. Riley, maybe you could comment, please, about your experience out at Perkins with the Sonic device.

Mrs. Riley:

I teach cane travel at Perkins, and have for three years. There are several other teachers there besides myself, who are graduates of the Boston College Program.

We received two of the ultrasonic aids several months back. We have experimented with them, in light of the directions we received with the instruments, in certain trial runs. We experimented, primarily, with high school students, between the ages of 15 to 21, and probably a dozen more students have come in contact with the aid. Unfortunately, their class schedule being what it is, none of them were able to be subjects of what you would call intensive training. It was getting towards the end of the year, they were trying to finish their cane travel course and, as much time as we could, we took out to work and experiment with this device.

The students that we worked with were mostly congenitally blind children, and this was a point which was in the back of my mind and, arriving a little late, I did not hear who the subjects were discussed with the first aid. I wondered if this was going to make a difference between the adventitious and the congential, in light of the fact that the electronic aid lost physical contact with the environment. This bothered some of the students to a great degree, particularly those who seemingly had some vision, even if it was just light perception. However, I found with the congential children, who had no visual memory whatsoever, were not at all interested in contacting the environment in any way, shape, or form. They merely wanted to avoid it, and get there as easily as possible. So, this was the question I had in my mind, but, under the circumstances, I couldn't explore this more fully. I gathered from the other teachers and from the students I experimented with, that the sound, itself, was 100% unsatisfactory. Quite a few complained of headaches, after a very short period of time. I don't know whether they expected a symphony orchestra coming through or what, but they wanted a very lovely, melodious tone that would vary when the obstacle contacted something, but they did not like the vibrating sound that persisted.

They were completely unable to detect any kind of drop-offs: the stairs, the curb, or things of this sort, or, in outside travel, such things as poles and narrow obstacles. I'm not sure how valid these observations

are, because none of them worked with it over 15 hours, at the maximum, and this immediately limits the validity of anything I might have to say, because they were not intensively trained with it.

The general comment was, that every one of them was excited by the thought of being able to use an electronic device of some sort, rather than the cane or the dog, from the conspicuous standpoint. They thought this was a good improvement. However, many of them were concerned cosmetically, with the ear piece, in that they thought many people would assume that they might be deaf also, and start yelling at them. When in case, this did happen, where someone assumed that there was a hearing problem also, this made the student quite uncomfortable. As many of them have pointed out, when they are out many people assume that blind people are deaf anyway and they whisper or talk loudly and assume that they don't hear them. This added instrument in their ear bothered most of them, to some extent

They were able to maneuver indoors more successfully than outdoors, except when it came to stairs. They were very hesitant; none of them traveled even half as fast with this aid as they did with a cane. I would say definitely that an intelligence factor figured in here, in that the brighter student and the most successful student with a cane was also more successful in the pitch variations and sounds associated with this aid. The slower student, who lacked spatial perception, was not aware of many of the pitch variations. I found that in almost all of the cases, and again I think this might be worked out with more training, the environment awareness was cut down considerably, and many of the traffic sounds and typing sounds in a class room and things like this were completely ignored by students who are usually acutely aware of these things, because their concentration was so great in trying to pick up the different sounds in this instrument.

I think that's about all I noted. Are there any questions?

Mr. Mungovan:

Was all the travel within the Perkin's grounds or was some of it outside?

Mrs. Riley:

No, some of it was outside. I purposely did

this, because they are so familiar with the grounds, it really makes a false situation to test them within it.

Mr. Meldelson÷

That pleasant symphonic sound, you said the youngsters felt deprived of, did come about actually on the interposition for the device on the attractive blonds, every time.

Mrs. Riley:

I might mention one thing I forgot, about the size of the instrument. In no way was it displeasing to any of them. They thought it was fine; the weight was fine. The other thing that bothered them, that I noticed from a teaching standpoint, and I had not expected this to arise, was the difficulty they had in scanning, in that they very often could change angles and be completely unaware of the fact that they were not holding it in the same manner that they had started out to do, and they were completely unaware of the fact that their hand had dropped, and it had turned one way or another. I find this, particularly with many of the congenitals that I had taught with the cane. Also, the ones that are less mobile and really less interested in being mobile but only interested in being protected. The cane gives them an adequate amount of protection, but they are not particularly interested in the effectiveness of just how mobile they are. So, this was a problem, even with some of the better travelers, that this position of the instrument in relation to the body and the actual angle it was being held on, in no circumstance was 100% successful. I had to constantly remind them to tip it up or to turn it down or push it one way or another. I don't know if this, anyone else picked up or not, or whether this is a congenital problem, with the congenitals, or if this is something with the advantitious also.

Mr. Korb:

Did anyone try a combination of the two- a cane plus the device?

Mrs. Riley:

None of them felt they would use it without the cane. They felt, if they had to carry a cane as well as this, why bother carrying this. They'd rather stick with the cane. Either they want to use this, totally, or not at all.

Mr. Luini:

I was wondering if it (the device) had been introduced to someone who had never been exposed to any other type of travel device, other than the 50-year old man who was mentioned previously?

Jim Swail:

Not that I know of. Yes, he had had no other device, if that's what you mean.

My findings, about the remark about the cane, are that, if you try to use both, the information from both seems to overlap and confuse you. I think, in the case of training, use one or both.

Mr. Luini:

Are there plans to introduce it to someone who has never had any kind of travel-training at all, and use it as the aid right from the start?

John Dupress:

We're going to discuss that after lunch.

Jim Swail:

I think Kentucky are doing this too, but unfortunately, they're not here now.

Professor Benham:

We did it with the first device we tested in 1950.

Jim Swail:

You're not likely to be able to train these people very thoroughly anyway.

Professor Benham:

We found two or three blind people that hadn't been trained to travel, (in 1952 investigation), and the instructor went there and taught them how to use the instrument, got them out on the street and turned them into travelers. I don't believe it was the instrument that did it, I think it was the instructor that did it and, if she had gone there with a cane, would have had

the same result. You can't draw any conclusion about the fact that they travelled for the first time with an obstacle detector and, therefore, the obstacle detector must be pretty good, because I think they would have travelled for the first time with a cane, too.

Jim Swail:

Well, did they continue to travel when you took the obstacle detector back?

Professor Benham:

Yes. It broke them in and, when we took the obstacle detector away, they got a cane and continued. On a limited scale, of course, because they were not adequately trained at that point, but they did continue.

Mr. Meldelson:

By the way, for whatever it may be worth, a comment was made about the tactile device you discussed, that you could detect display windows. The comment was made by at least three, possibly all four, that on this ultrasonic device, they were able to detect and obstacle and they were distressed on learning that this particular obstacle was a plate glass window or a window on some kind. It was an irrational complaint, actually, because the cane did tell them this anyway. The display window usually goes right down to the floor level where the cane is making contact. They were distressed by the fact that they got a signal of a solid wall which turned out to be glass.

John Dupress:

They'd be more distressed if they walked through the glass.

Mr. Meldelson:

Nevertheless, there's no protecting them, in the sense that they knew there was an obstacle and could avoid contact with it. They wanted to know that this was glass. I say it was irrational, because the cane doesn't know that either.

Howard Freiberger:

With this device, on long training, you might begin to identify such things, because very smooth item such as a pain of glass, does produce a comparitively characteristic tone in the device. At least I have been able to hear this sort of pure reflector, if you want to use that term, and you get a rather unencumbered, mostly sinusoidal, sound back, as far as I can tell, and almost anything else will give you something else. So, at least a glass pane head-on normally approached, that is, with normal incidents, that I think you might tell, of all things in space, with reasonable chance.

Jim Swail:

But this takes a lot of using to be able to do this, and normally you don't want to spend time. What you want to know is, is it there or not there, but there are times when you do want to know something.

Mrs. Riley:

May I ask a question about whether anyone, who has experimented with this device, has found using an electronic aid differs from a cane in particular, in the ability to walk a straight line?

Jim Swail:

I think it's harder with a cane unless you have a shore line (by a shore line, I mean a line of buildings). This is one thing you can do with the aid: you can follow six feet away, whereas, with a cane, if you want to follow it, you have to stay close to it. If you're in the middle of an open floor, I expect it is easier to walk a straight line with a cane. That's my impression, at the moment.

Professor Benham:

I'm in the interesting position of deteriorating high frequency response in my hearing, so that I'm having increasing difficulty in using building front for straight line walking just by ear. For instance, when I walk down the hall in the college, I have to make more noise than I used to, to be able to hear the wall, and it's mighty frustrating.

The reason I mention it is because so many of the younger blind people who haven't lost that high

frequency response yet, don't realize how much they're using it to help them, and the ultrasonic aid, or the G-5 (the optical aid) is supplemented by their ear and they don't know it.

Jim Swail:

I think the argument about the obvious earphone may be partly overcome by these ear molds which the Kentucky people are playing. It's not a complete solution.

Mrs. Riley:

I wasn't sure just how valid this was, because all those who complained about this think nothing of walking down the street with a transistor radio earphone in their ear, which is exactly the same thing, with the radio hidden in the inner pocket. So I've thrown this out. I don't know whether this age group has anything to do with it, or not.

Jim Swail:

Maybe the whole thing comes back to something that we have to know about how to pre-condition the people at the beginning of the training.

Mr. Meldelson:

I wondered whether there has been any reaction to the need to carry the power pack in a case and slung over the shoulder. This was found to be annoying to at least two of the people _____.

Jim Swail:

It's annoying to me, too, but I think there are solutions to that. We can put the batteries inside the thing. I've got one here with the battery built-in.

Mr. Freiberger:

How long does it last now? Can you run one day?

Jim Swail:

One day of travel.

Mr. Freiberger:

We found that, in considering hearing aids and hearing aid batteries, one use a day is almost the minimum that you can nicely hope for in a device that's going to be used, that maybe isn't a panacea, and so on. If you really had something, maybe you'd put in batteries twice a day but, if it's something a little less than full sight replacement. and you are going to be bothered by putting batteries in, this also is going to prove to be a deterent. But, if it runs for a day, this, we have found, people tend to tolerate.

_____:

I was thinking that some individuals, for example people who handle dogs all day long, are willing to feed them, and take care of them and it doesn't bother them. I think that accommodating to these kinds of demands is probably individual.

Professor Benham:

There are a lot of side affects, with respect to the dog. People who are willing to do that, have a dog just as a pet, let alone a dog that's useful.

Mr. Freiberger:

We found that a fairly sizeable fraction of persons do not like to tamper with machinery too often. They can't. You lose a battery, you drop a battery and then you have to find it.

Professor Benham:

Well, they're willing to take pills to keep themselves going.

Mr. Freiberger:

That's apparently in a more urgent category. If the device produced enough, then I'm sure you'd put a battery in every hour if you had to. You could find a way. It's one of these trade-off human compromise situations. So an overnight charging, if achievable, seems good for most devices, as far as we found.

John Dupress:

Any more questions or comments before we get on with this?

Mr. Freiberger:

I have one comment which may be related. It's related to this question of audible versus tactile output. In one of the last papers that Patrick Nye wrote, while he was still in England (I think he's in California now) he discussed another subject, namely the reading for the blind, considering, especially, the optiphone system. He went into an psycho-sensory sort of an analysis, on an intuitive basis, somewhat as follows. The disposition of ink on a page (say, the X-Y plane) is somewhat analogous to the placement of objects in space on a X-Y plane - things we're trying to avoid. He feels this can be sensed best by one of our senses that is keyed to feeling and sensing the X-Y plane, and the best is the tactual. The ear is not good, apparently, for this sort of information input. It is good for serial and time sequences, etc. so, he brings forth this argument in favor of tactile stimulation, to get print from a page, and it seems to have some analogue here, in terms of an advantage in the tactile-to-print, to bring in information about the environment as opposed to the auditory.

Mr. Meldelson:

Would you reorient me to your total statement by defining the X-Y plane?

Mr. Freiberger:

Just a two-dimensional plane, let's say, or three dimensions. We learn, even it's thought the process of sight somehow depends, at one time or another, on feeling things in three dimensions. There seems to be a lot about feeling, even in the development of sight. You may not know what a cube is, if you looked at it for a long time, until you felt it, as a child, and had those types of experiences. These seem to be intuitive appeals to the value of tactile, as opposed to auditory, as the information channel through which information of the environment should come in to a person. The physical placement of items in the environment. This may account, in part, for why the cane is so successful. This sort of an extension of the traditional probing device of man, so you'd expect it to be pretty good. Whereas, if you go out with an electro-magnetic probe which is excellant,

where it's necessary to get far away or to another planet. Maybe that's why it isn't so good for man. There's a slight consideration that it is an extension. If you hold a flashlight and probe a beam, in a way it's an extension of the hand, but the feed-back loop is different. These are intuitive thoughts, which may have little consequence.

Jim Swail:

I'm inclined to agree, Howard. I think that, if a successful tactile device is developed, I would certainly prefer it, from my experience with the G-5. This Kay device seems to be giving so much more information at the moment, that I'm willing, at least at this stage, to accept what it's doing. Now, if Tom comes up with a better mousetrap with a tactile output, I think I would definitely prefer it. This, again, is intuitive - only from limited experience.

Mr. Freiberger:

It's obvious the Kay device is carrying in more information, I would say. If you just stuck it in one direction and probed out, without scanning or anything else, the Kay device, and say the type of the G-5, can produce more, because there are many more variable involved with it. It's sweeping in frequency, and that means its band width is constantly changing, because he has a fixed transducer there. Then there are selective absorptions of bodies and the geometry of bodies. So, the sound returned, if you ever knew how to analyze all these things, certainly tells more than you get from that sort of unidimensional pencil optical projection. That's why there's more information in it. How it can be used is what seems to require these years of immersing yourself in these sounds - somewhat like the way a child immerses himself in the physical world and reaches out and touches everything.

Jim Swail:

Of course remember this that, in the sense of the auditory thing, in travelling we blind people already use theirs as a ranging device. Maybe this isn't really so different. We hit with the tip of the cane to make it click, in order to find out where the buildings are.

John Dupress:

There's one other group which may have some experience with the ultrasonic device. Would one of you gentlemen from Cleveland care to make some comments along

the same line that we are pursuing now?

Mr. Sakata:

I have used one of the instruments (there are two in the Society) for approximately three months. The first month that I had it, I was not impressed favorably other than as an Engineer. I thought it was a marvelous package they had there but, as far as use goes, I'm not too impressed. However, in reviewing my notes before I came East, the second month I began to get a capability with the instrument that I never dreamed I could attain and, in the third month, the present month, I find things going quite favorably, to the extent that I leave my cane behind when I use it, which I would never do before. From the comments here, my capability is going along with I think what you have found. There is an up curve and a down curve capability beginning to assert itself a bit now, in the third month. To follow the shore line is a fairly common thing to do. I find that I am relying upon this now almost completely and I can leave the cane behind.

There are several major objections to the instrument itself; one is the packaging. I didn't care for the power pack over the shoulder and it eliminated that a little while ago. This is much more convenient. The binaural capability I found quite distressing. I could not use it effectively, with one ear almost completely blocked. I just recently changed this and I find it very, very different now having both ears working independently, and the output from the instrument independent of encumbering the ear itself. I think this will go a long way toward making the instrument more acceptable.

John Dupress:

Has anyone else been exposed to the device out in your area?

Mr. Sakata:

I am removed from Cleveland, but I have not exposed anyone else to it myself.

Mr. Holcomb:

We have found a lot of people who are unapproacheble with the device. Maybe people out in the Mid-West and the Eastern Coasts are more conservative, that it's difficult to get people to change. They're not as

flexible. One thing we do notice though that people who are acceptable of the device, from a personality point of view, are not as rigid. They're more flexible in their attitude and approaches towards things. So, I'm not so certain that this is an intellictual thing, that you can actually measure from an intelligence quotient, as it is a personality thing that reflects ability, how impressionable a person is, how acceptable he is with new ideas and concepts. I think this is our starting point here, that is, evaluating people and the use of the device. Other than that, we have not taken any concentrated or extensive steps in using the device.

Mr. Sakata:

Comment by Mr. Swail about developing some beacons for use with the instrument. I've been playing around with some passing beacons very successfully, and I find them very handy to use in blocking locations of homes.

Mr. Freiberger:

In forms of reflectors, and things like that?

Mr. Sakata:

Exactly.

Jim Swail:

When you said you were _____ your ear, were you using the shell ear molds?

Mr. Sakata:

No, I first went to the air-conduction-type of ear phones (Telex varieties) and I was not satisfied with that, asthetically. I wanted to try and get this thing off my head. It's bad enough to be carrying a flashlight. I've eliminated the shoulder strap and I want to eliminate the earphones, so I've bread-boarded up and external speaker just within the last few days. You have the problem of noise, and it will bother other people and make it more noticable, in that respect, but it's a question of am I going to use it, or aren't I going to use it?

Mr. Freiberger:

You have a little speaker on your coat, you mean, or in your pocket?

Mr. Sakata:

I have a little speaker _____ _____ _____ _____.

_____:

Do you feel that that is less conspicuous than the ear?

Mr. Sakata:

I really don't give a darn if it is conspicuous. It works better. I haven't reached the stage yet where I'm worried about being conspicuous, other than having the earphone.

Mr. Freiberger:

Is that what you went by binaural? I didn't fully get that.

Mr. Sakata:

I'm very dependent on travel cues.

Mr. Freiberger:

You mean your regular binaural hearing - you want to preserve it?

Mr. Sakata:

I want that in just as high a state as possible.

Mr. Freiberger:

And now in a sense, you are going to hear this through both ears?

Mr. Sakata:

In the short time that I've had the speaker in my pocket, I can accommodate the noise, if you want to call it that, from the speaker to my travel cues, to both ears,

without any fatigue at all.

Jim Swail:

Have you taken this device into a large city at rudh time?

Mr. Sakata:

Yes, I have.

Jim Swail:

Can you hear the speaker?

Mr. Sakata:

Yes, I can hear the speaker, although I might have to put another stage on that thing to push it up. When it dies out a little bit, you do the same thing you do when you have a cane, you stop, and wait 5 seconds.

_____:

Has anyone considered bone conduction?

Jim Swail:

I tried it some years ago, and I found it very inefficient and not very good, as far as frequency response was concerned. This is very important with this device. Now, maybe I had the wrong type of ears - I don't know. The Kentucky Group has just tried some bone conduction experiments. I don't think it will work.

Dr. Riley:

It's going to take considerably more power, too. Did you put the power pack in properly? I'm interested in what you did with the power pack.

Mr. Sakata:

No, I probably did the same thing Mr. Swail did * - attached it right to the end. To my way of thinking, the weight is still (and I'm using the heavy transistor battery yet) comfortable.

* Mr. Swail did - attached it right to the end.

Jim Swail:

Well, I'm using a _____ _____ battery pack, and I'm to go to a silver-zinc alkali.

Mr. Sakata:

Well, I've got a nickel-cad.

Mr. Meldelson:

On that issue of the sound projection, around the use of it, I might say that my own use of it (in my own neighborhood) several Saturdays or Sundays in a row, when children were playing in the neighborhood and there was a fair amount of distracting noise, I turned up the volume on the ultrasonic aid, and discovered that the sound was pouring out pretty generally. It got to a point where the youngsters were saying, delightedly, here comes the man from Mars. The electronic beeping signals were pouring out around us.

Mr. Freiberger:

I was thinking it may have the similar effect as a cane, then, in terms of avoidance, too _____ that kind of marking effect _____.

John Dupress:

We will resume the meeting please. The first item on the agenda is to play the tape which Jim Swail brought with him. (Tape played). Now we go audiovisual.

What we have here, essentially, are a couple of three minute films. In one case, the subject - namely me - is heavily instrumented with a frame from a world War II army pack. An ultrasonic sounder device developed by Lindsey Russell, was mounted on this frame, together with a Fairchild Movie Camera which was tipped sideways to obtain the field in which we were interested.

Sylvia Tufenkjian:

Before we start, it might be helpful if Lindsay would briefly describe and show the device.

Mr. Meldelson:

Excuse me. Could I interrupt, before we leave

that recording we just heard? I did have one thought, and it was triggered, by the way, by the comparison of the sounds from a wool coat and the corduroy coat. Has any attempt been made to analyze the differences in sound, the range of variation, through the use of an oscilloscope?

Mr. Freiberger:

Kay has looked at them.

John Dupress:

Yes, he's looked at the scope pattern.

Mr. Freiberger:

And even made some _____ _____ to show why these sounds would be different.

John Dupress:

And also, there is a report on the technical accuity, or rather , the technical performance of the device, which was done at the National Physical Lab in Teddington, prior to the present evaluation. When I was over there, that report wasn't classified. It was just that they had only gotten the draft version at St. Dunstans. Whether they release it later remains to be seen, but there is a report of some fairly careful physical measurements done at Teddington. I'm sure it includes some kind of scope analysis.

Mr. Freiberger:

I wanted to ask one question of you, Jim. Those sounds on both of these tapes, sounded a trifle better, just to use that word, than the sounds of the devices I have. Now, I think those recordings were made by coupling-in electrically, weren't they not? You weren't listening to a earpiece with a mike or anything?

Jim Swail:

That's right.

Mr. Freiberger:

Coupled electrically and played through a good system here. I think that's what accounts for it.

Jim Swail:

With a proper earmold you do get pretty close to that but, with the earphone supplied, it's not very good.

Mr. Freiberger:

That's right. I found this an improvement over what I normally hear.

John Dupress:

As a matter of fact, the one thing that I tried to pursuade the Ultra people to do was to make a little better earphone. They just took it in one ear and it went out the other. I really felt that that was the road block at the tale end of the system.

Mr. Freiberger:

I could add to that, by saying of the ten units they sent me, one of the earpieces was defective. One was defective, but I found that's a common fault, even with our own hearing aid pieces, in that they're very small and the jacks are not too well made so, if you insert a plug a little bit incorrectly - force it or bend it - it may interminably deform the jack contacts. It's never good again.

Two other things I observed with it: An easy way to check, or something interesting, it has a little carrying strap on it.

So, if you just hold the device, hooked it under your pinkie through that carrying strap, it hangs about normal to the floor which is usually a pretty smooth surface. Then, if you just raise your hand up and down, you can get a quick check of the range: you see that it ranges nicely and pure tones are coming back from the flat surface. I found that to be a very quick and eay check. One other thing I observed, which we didn't hear on these tapes and which I thought perhaps we would on stairways, etc., there's an iron fence outside of my office (about 1/2 inch iron work about 6 inches apart). Now, if you stand in front of this thing and range in on your closest iron bar, you get a certain tone. Then, if you have trained the device in azimuth, you can up successive bars and it sounds just like a piano, because you're difinitely getting successive range. Now, we didn't quite hear that on the

stairway, here. This (the tape) was extremely clear, and was very nice.

Professor Benham:

Howard, wouldn't there be another difference between the stairway and the fence, in that you would hear the treads as well?

Mr. Freiberger:

Yes, but I thought you would pick up the successive _____ or rises every so often with increasing _____ _____ pitch.

Jim Swail:

No, it's a little hard because you get scattering.

Mr. Freiberger:

And you get square corners ther, I guess, reflecting heavily, and so on.

John Dupress:

Quite a complex spectrum of reflections.

Mr. Freiberger:

Incidently, that was one way I had hoped to test the thing, but our photographer says we can't due it too easily in our shop. To take a motion picture of each unit on a device, not a man made, but on a device which w would first look straight aheas at a wall, then it would train downward and look at the corner between the wall and the ground, then it would train normally into the ground, and then turn off at another angle, so that you can get a variety of these sounds and corners and textures and azimuths in at one shot, both on a film and in sound, so that we could see how the ten of ours sounded and consider it at our leisure again and again, to see how they vary etc. We may try to do something like this, just to see how uniform the instruments are, before we send them up for evaluation at Dr. Riley's Center.

John Dupress:

I think that would be desireable, because the

people at NPL have tried some out and they have found differences. That's one of the things they are going to sort out.

Mr. Meldelson:

There's another aspect of this, that I've wondered about in working with the ultrasonic device, and I wondered whether any consideration has been given to it. Admittedly, this is pure hunch, pure intuition, but the high pitch of the signal, in most of the sound that you get from the device, and the frequent or very rapid beats I think is decidedly a psychological irritent. I wondered to what extent (a) to what extent my observation is correct, or replicatable, and (b) to what extent the psychological irritent, if that does result, would interfere with the learning process? Did any of the others who worked with it find that irritating?

John Dupress:

I did an earlier prototype of the same prototype that was evaluated in the latest Carpenter report. It was reduced, markedly, in the production scheme and the answer is, I think, that you can keep the volume down enough so that this is not too serious a problem, although I would prefer not to hear anything when there is nothing useful there. The answer to that, given to me, is, then you wouldn't know the thing was working.

Mr. Swail made reference of the fact that he found it, what did you say, nerve-wracking?

Jim Swail:

It's a bit tiring, I find. One thing that I would like to see put into them is a volume compressor, because some of these sounds, for instance, the stepdowns, are pretty subtle and their well down in the signal level. If you have the volume set, it's going to take your head off if you get a straight normal reflection.

John Dupress:

I thought they put some compression in.

Jim Swail:

Well, if they have, they haven't put much. I think it certainly needs some compression. It also needs

a different shape beam, I think. A bit wider than the vertical, so that you can look at the ground and look straight ahead at the same time. This seems to me to be the things that should be done to it.

Mr. Freiberger:

The sound level is certainly not loud enough to cause damage in that sense - physically to the ear. So, the psycho-acousticians tell us, that sounds you really don't want to hear, in time, don't bother you anyway. So, you may not even hear all this back like sounds in time, and only hear what's giving intelligence.

John Dupress:

As I can testify to, often when I was using it and there was someone talking to me, it would be beeping away at me and I never noticed it after a while. I get so I never paid any attention. I could walk up to someone I knew, who had spoken to me, and there it was beeping like mad and I wouldn't pay any attention. Whether the person I was talking to was annoyed by it, they didn't seem to manifest any annoyance. It's the kind of thing you can't put out of your mind, even though, if _____ _____ _____ _____, you can bring it back into your attention level by just willing it so.

_____:

I noticed that some of the differences there between the sound patterns were rather subtle, and I wondered to what degree is the average sighted person, or the blind person, able to distinguish these patterns?

John Dupress:

It takes a lot of experience and use.

Mr. Freiberger:

No doubt there will be ambiguities, too. Maybe a slot would look just like a projecting thing, possibly, in some odd cases.

John Dupress:

Now we'll get back to Lindsay Russell and the films.

Lindsay Russell:

This device of mine, which John is going to be using, it's also an ultrasonic detector. It, unlike the other two, is intended quite specifically for cane users. It's intended to complement the cane by exploring, with a short six foot range, the region through which the travelers head and shoulders are going to pass. It is so adjusted as to remain absolutely silent if the path is clear for six feet. It looks like a small camera of the sort some people carry by a neck strap. If something comes within six feet, it makes a ticking sound. The ticks get louder as the thing approaches and, when it reaches the 30 inch point, the sound changes abruptly to a set of beeps, so it sounds like this.

The only testing of any real consequence has been done by Mr. Dupress through crowds and through the streets and through Grand Central Station, etc. There are two basic functions that it has. One is simply to protect you from what the cane won't meet that doesn't go down to the ground. The other is a people finder. When you're threading your way through crowds, and you want to find out if the door is open, and if there is someone blocking it on this side or the other side. You can get the knack of interpreting this, along with other auditory cues, and avoid poking people with the cane. The reason for this particular type of read-out which is as much John's doing as mine, is that when the path is blocked, apparently you must make a decision at once, whether it is close enough so that you must stop or whether you could chance another stop or two. That's the reason for the beeping sound that starts at 30 inches. The other thing, this build-up of tick loudness as you approach, stems from what appears to be a useful feature. That is, an object in the outer zone - it closing fast, or is it holding the terrain? I guess with that, John, you can go ahead.

Sylvia Tufenkjian:

I would like to say that these movies are an attempt to record a performance of somebody using this device. It's not an evaluation, per se. In this film the camera and the device are mounted on a pack frame which is worn suspended on the chest, the device assuming it's normal position. The camera with a wide angle lens, is mounted on its side so that it sees the same area as the device. Consequently, it has the same range so it's seeing what the device is seeing. (FILM SHOWN)

John Dupress:

You might be interested in asking some questions.

Howard Freiberger:

The device is probably readjusted now to a better condition. It sounded even better now.

Sylvia Tufenkjian:

In this next roll we have two transceivers, one is on John and the other is up on the balcony with me. This way, we can pick up the output of the device.

Lindsay Russell:

Before this, we decided (after John had practiced quite a bit) to see just what he was doing and what good it was doing, so I walked ten feet behind him with a little tape recorder (in a briefcase) and a little radio link broadcasting back the signal that the instrument was giving him. I had a microphone so that I could record what was happening. We walked through the corridors of MIT, which abound with booby traps because students walk along three or four abreast, they don't look where they're going, they stop to read the bulletin boards (of which there are probably 300 interspersed throughout the buildings), and they expect the sighted traffic to walk around them. We found that, when you tried to dictate on tape what was happening and what the people do who cross his path, things happened hopelessly too fast and were too complicated. The thinking at the moment is that, in pedestrian traffic, you have about 300 milliseconds of chatter from the instrument, and it must contain enough for you to make a preliminary decision. You have to respond in about another 300 milliseconds. If you say why not lenghthen the range to ten feet and get a little more warning, the news of the pedestrian at ten feet is useless information. He's apt to be anywhere after John takes a couple more steps. With a pedestrian at ten feet, your best tactic is to stay right on course and let him get out of your way.

_____:

How about the speed you would travel at? Would that change the rate?

Lindsay Russell:

Well, you'll sense, I think, that he's bearing down on you fast by the fuild up of ticks, as he's coming _____ _____ _____.

Sylvia Tufenkjian:

These are the balcony pictures. In the first half of this film,

John is hearing the output of the device. In the second half, you will be hearing it, but he won't. Actually, he'll just be relying on his cane. (FILM SHOWN)

John Dupress:

Do you have any questions about this particular series of experiments or this film?

I might interject here that we reviewed the previous evaluations, and it occurred to us that there were three categories for evaluating the devices. Category one is the controlled laboratory situation. We felt this indispensible in training people to use the device, because it is necessary to gain a reasonably firm grasp of what the person and his device do under certain conditions in order to get some idea of the man-machine interaction. It's also good for gathering data from which journal articles can be prepared.

The next category of information is out-in-the-field conditions. The question here is, should we just give a person the device and a minimum of training and let him go, and get his his reaction to it? Perhaps at a time in the finite (or infinite) future someone will have a device which is so eminently useful to enough people that this is the logical thing to do.

The third category is one in which you try to combine some of the virtues and, hopefully, as few of the faults as you can take from the previous two schemes, and you try to do some simple-minded research on how you improve evaluation procedures. So, before you start doing very much of this, you look back on what has gone on before.

We would like to do the following next year (if they'll give us the funds in Washington): One characteristic of these evaluations is that so far the mobility device is supplementary. Although it can be said that some of the devices we've talked about can be used without a cane or a dog, I really wouldn't recommend going around in unfamiliar or semi-familiar places depending upon them to get you safely through. If the device is supplementary to the use of a cane or dog, we think that you should have enough operational conditions in which the device is just that - supplementary. If the device has to be hand-held, let's mount it in such a way that a person can still use a cane.

The second thing is that we don't really think that you can round up enough blind subjects from whom you can build up a control and experimental group, and match them for many variables including personality traits, motivation and experience in non-familiar and familiar environments. So, we think we should allow the subject to be his own control. You do this by letting him go through a number of areas which you know he wants to operate in, in real life. In one set of experiments, you have him using the device and the device tells him what it can about what is going on. Then you have

him go through the same sort of situation in which the device is telling the experimenter what it finds, just as it did here, but the subject doesn't know what the device is relating.

The third thing is having better ways of monitoring or telemetering the cues. Even if we don't know how to evaluate it properly, weight it, we like to think that, if we have it, someone else with more creative ingenuity will come along and do it better. While we have reports on everybody's evaluations, we don't really know what the device told the person at the time the experiments were run. You have seen some films of the English device and you don't hear the sound. You have a report on what the boys did, what their error scores were, their time, etc., but you don't know what the device was actually telling the person. You only know what the end porduct was of the performance, and we think we're missing something if we don't know what the device tells them at the time.

The next thing of importance is that, since you're trying to sense any increments of gain or decrements in the decline of performance, you commit yourself to operating in the field and to gathering a lot of data about people going through the types of conditions they are used to. Another problem in evaluating people with devices is that you should be able to modify your display somewhat. Our emphasis, therefore, will be on devices which are research tools.

The next topic on the agenda is the two evaluations of the Kay-Ultra device, one in England and one here in America. Dr. Riley, will you proceed?

Dr. Riley:

As soon as we acquire the very essential services of the key man in the project, the experimental psychologist, we hope to be able to get going with the operation of the Veterans Administration and their instruments. Our plans, which are still capable of being modified, are that we will start with a number - 40 subjects. Hopefully, these persons will be selected from some 80 candidates. I'l like to see the evaluation done this summer and the training started in the fall.

The reason for settling on the number "40" subjects was the fore knowledge that there were going to be dropouts and also ignorance of how to decide what proportion would be represented by dropouts. But, if we lose 25% of 40, we still have 30 subjects. If we lose 50% of 40, we still have 20 subjects and, hopefully, this would be a number that would be sufficient to stand up under a reasonable analysis at the end.

The population to be selected is going to have certain constraints. One is that they are going to have to be, practically speaking, either residents of the greater Boston area, or they are going to be fortunate in having some efficient means of transportation to and from the Boston area every day. In age, they ought to be representative of the Veterans

Administration blinded population, so that we are really aiming at relatively old people, men in particular. We are trying to limit our subject population, in so far as we are able, to persons who have very little or no sight, to persons who will be the respresentative, age-wize, of the expected cases of blindness to be handled by the Veteran's Administration in the next decade. The practical issue behind the evaluation, the one question that we do hope to answer and practice is, do we or don't we recommend to the Veteran's Administration that an instrument such as this is a prize possession. Those of you who have other interests probably will be very disappointed in the outcome of our study. I said we'd start with 40 and hope we finish with 20 or 30.

I was glad to hear today comments made about how long it takes to train subjects. Our plan is to have a training and testing program which will take up six months. Approximately 20% of the time will be spent in testing and approximately 80% of the time in training. Hopefully, as the result of day-in and day-out training by a staff of instructors, some of whom will be on the testing team, there will be a lot of feedback from the subject users to the instructors and, hopefully, an on-going improvement in training technique will occur as a result of this. We have arbitrarily broken the thing down into five-week components, so that we get five of these. During the testing this summer, it is our intent to formalize and decide upon the training methods of the first five weeks. During that five weeks, we will be deciding what we're going to be doing in the second five weeks, etc. That's what I mean by hopefully there will be an on-going improvement in training technique. It will be like five individual training projects, with testing at the end of each little individual training project.

I don't mean to exclude women from being subjects, but I understand the Veteran's Administration doesn't have very many women in it.

We have already discussed and have made some plans for the building of a standardized indoor area obstacle course that is about 2800 square feet and has very high ceilings. In addition, there will be an outdoor course of a similar nature. The subjects will, in time, become familiar with these courses so that they will serve at first in semi-familiar areas, and later they'll be familiar. Effort will be made, too, to find out about the difference in use of the instruments under each of two conditions, one of which I'd call static and the other one dynamic.

One of the things I noticed myself doing, and I noticed some others in the room doing it when we were listening to the Canadian tapes, was I was moving my hands. We were, with our hands, making a guess as to where the instrument would be pointed - up, down, left, right. Some of us were mimicing the scanning rates. I think that these things are very important, that each one needs to be studied and, as John says, a method of recording these observations badly needs to be developed. The impact of approach - now we're getting into the point that the Doeppler effect obtained here - or moving away from an object, when combined with the ability or the presence of some

right-to-left scanning, is something else that is capable of being studied separately and, right now, we have the intent to study this effect.

I don't know whether you ought to train a man first to use this instrument while he is standing still or sitting still, or whether you should first train him while he's allowed to move forward in front of an object. I don't know whether it's easier to learn by bits, which would be in favor of having him stand still first, or to get all the information together first. Last week at our discussion, we left this open as being a possibility that we might, even by process of random selection, train half of the subjects one way and the other half the other way.

I'm trying to think of other headings of comparison; there's the static, the dynamic, the indoors, the outdoors, the familiar, the semi-familiar. There is an item which I think is important, which I know Ted thinks is important, and which has not been mentioned at all here today. A couple of us are presumptuous enough, not being blind, to think that a blind man has a right to get more enjoyment out of travelling than we think he does get, and we wonder whether or not the use of this instrument, with the associated ability to gain more information about the environment, will be of value. I think a side and indirect reference was made to this already today in a negativistic fashion, when it was said that the user, instead of speeding along the course, became interested in the objects that were around him and was very embarrassed by the fact that one of them was blonde. I say this very humbly - I'm no judge and I want to withhold judgement. I don't know much about being blind, yet.

As far as travel, nagivation, and minimal necessities for orientation are concerned, this information is redundant from all these points of view. But, I still think there is esthetic value in this information. Just because he (a blind person) doesn't know that the tree is green and that it's a weeping willow, I don't think this is going to completely prevent him from appreciating something about the texture of this tree, especially when he's able to look at it both in the winter and the summer. I really feel there's a lot in this. Can a blind man use his ears to appreciate the beautiful , when you put a Kay instrument into his hand? I think this is important. And, of course, the way we would try to find that out is to give him a chance. We'd have to accept absolutely whatever feedback he gave us in an interview, as to whether he got any sense of appreciation of the beauty of what he was looking at.

The only other thing I can think of to say to you now is the other variable which we wanted to make sure we had in the study was the presence of snow on the ground. This is one of the reasons why it's important to us to get the training and testing started at the time of the year when we would be able to have the subjects go out in the snow - not at the end of the period, but rather near the middle of it. I'd like to have them on dry ground before and after, with snow in the middle.

Jim Swail:

I have a couple of comments to make. Tim Cranmer of Kentucky has made up a training manual which they are actually using. I thought you might write to him and get it. You probably wouldn't have to use it, but you might get some thoughts from it. Maybe you already have it, or know of it.

Dr. Riley:

I know of it, and I don't have it. I have some very funny rebel ideas on this, Jim.

Jim Swail:

Well, that's up to you. I thought in case you didn't know, you might want to look at it.

The other think I wanted to say, when you were talking about getting a sense of the surroundings, I do get this when I'm in an area where there is time. I think when you're in the middle of town, you don't have time to look at your surroundings much, but in the suburbs I do. All of a sudden, I say, "My gosh, I didn't know there was a tree there," or something of this sort.

Dr. Riley:

Well, Jim, those of us who can see, when we're in the middle of town on a busy afternoon, don't see the pretty things there either.

Jim Swail:

No, this is the point. I was just trying to make out that I think something could be said for what you're saying. You can get an appreciation of what's going on, whether it's a sense of duty of just a sense of interest.

Prof. Lukoff:

The type of program Dr. Riley just outlined represents an attempt to approach it systematically on several axes, and I think this will add a lot of knowledge not only to this particular instrument, but maybe how to evaluate many of these types of things. I think there is one problem (I suppose you've faced it and you're dealing with it) that any kind of project like this hinges on, and this is something no one really knows yet, and that is the criterion measure. How are you going to evaluate it? What is good and what is bad travel? I don't think this has been, to me knowledge, systematically so. Other people raised the question, but I don't think anyone has come out yet with a good answer. There are a number of dimensions to the problem, and they are somewhat independently marked (not terribly hard data because these were self reports). You get the extent to which there is

independence, or travel extensiveness, or travel frequency. They're not perfectly correlated to each other. There's some independence between these things, yet they're all aspects of total travel ability and probably, if you thought about it, you'd find other dimensions or components to it. I think the success, no matter how you match your groups, how carefully you control your stimuli, or anything of the sort, if you don't have satisfactory criterion measures, you can't do anything with results at the end. It would seem to me that any project (and this is a general kind of thing) would have to decide what would be the satisfactory criterion measure, before they could even proceed effectively, because you can collect very precise data all along the way and there's no way to put it into matrix to say what difference does anything make at all, unless you have these criterion measures.

It would almost seem to me that a good strategy, and a value to research in the whole area of mobility, would be to first work on the criterion problem. This is a problem in many areas where research is done without knowledge of what's good. One of the reasons we know so little about mental health is that nobody knows what is mental health. I don't care how innovative researchers are, we still know very little about it, because we have no good criterion measures. The other methodological issue here is identical to that. I think you are misinterpreting Worchel's experiment, earlier, but one of the reasons some of the results may have been a little against what you would have expected is precisely because he chose the number of times he bumped into things or something like that. It's hard, and it's easy to obtain, relatively. You can _____ reliability, but it may not be enough of an indicator of what you mean by travel. It might be necessary to have, even though it would be difficult to add them up later, a breakdown of travel into different components and facets, and see how you can account for differences in certain features of travel that can be fairly systematically observed. But, this would seem to me to be imperative for the whole range of research in all of this evaluation business. Watching John going back and forth in the corridor with and without the device, I couldn't really tell you very much about the difference in his performance. I was told that sometimes he was listening to the device and sometimes he wasn't, but it didn't seem to make much difference in the way he was walking up and down that hall. What would have been an adequate criterion for John's performance down there?

John Dupress:

I'll tell you what we used as a criterion. So far, we have only two criteria which we think are valid, and yet there's no coefficient of validity of what to correlate it with. In one criterion does his performance change in a positive direction, that is, does he go faster, does he hit fewer objects, does he do anything markedly different from what he was able to do in exactly the same conditions with the device? If his performance doesn't change in some direction, then that is the criteria. It's a crude one, but .....

Prof. Lukoff:

Well, that's why you have to get beyond any change, even if it's on the first basis that you make some bum judgements. What changes? Bump into a few people, move faster, get around the obstacles with less pause? All of these things may not fit into a neat package where you can throw them all together. This is the issue that goes back to your earlier comment. I think most people know, or feel, around the table here - and rightly so - that field evaluations are the ultimate, but the contrived type of situations are only first approximations. On the other hand, until you've broken down this thing into manageable entities, and maybe know something about where this information is useful and where it is not, you're not going to be able to evaluate, in any useful way, the field situations.

I think the attempt to give the device to people and let them go out and use it may result in a premature rejection of something like this. I think this should be more carefully considered, because if you took trained dog guides, as an analogy, and gave them to untrained people, I don't think one in a hundred would end up knowing how to use that guide. One or two people might work it out after a while, but most people simply would not. Then, you'd say, "Well, look, 99% failed, so why bother?" But, it doesn't work out that way in the real world. Dog guide schools say about 65-70% of the people keep on using the dogs once they've got them. So, the rate of failure is much lower with the training. I think you have analogy here. You still have to learn how to train people, and a lot of the things you're doing will help to add perspective on this. You might learn a few things, but not much - I don't think. But, I'd hate to learn about dog guides from people who aren't trained in the use of dog guides. I think the same thing would follow for the device.

Dr. Riley:

Incidentally, apropos of the movie with John in the corridor (the movie taken from the balcony), that was a pretty complex situation, in that the walls of the building stayed in the same place all the time, but the people weren't in the same place. There were times when the corridor was jammed with students and other times when he had a pretty free path. When you try to analyse the familiar versus the unfamiliar or semi-familiar, that's a beautiful example of a semi-familiar situation.

John Dupress:

The terrain is completely familiar to the people. I'm familiar with people, obviously, but I'm not familiar with where the students are going to be, so that pattern is never the same. The geometry of where they're put - everything changes constantly morning until night, day to day.

The other criterion I was going to mention, and it's a very crude one, is how interested a person is in using the device when he is not in a testing situation, or when he's not in a training situation. This is where

the device is acceptable enough so it's doing something useful that he wants to use it. Now, it may turn out that the devices we're talking about aren't quite at that stage yet, in which case you're going to find out negative results by seeing how often he uses it, if he uses it when he's not in a testing evaluation procedure.

Prof. Lukoff:

I think that's a good point, but I think you have to do this in stages. You have to end up - can people adopt this to their normal working environment? I think you'll find some do and some don't. Obviously a good many blind people would rather accommodate by making life much simpler for themselves by not having to move around very much, and this device, itself, might help some of these people, but I think mostly it will attract those who are already fairly good travellers. It will just make them better travellers. I mean, this is what is likely to happen with a device like this, because you're not changing the whole sociology and psychology of blindless with this one gadget. But, you've got to be a little more open to the precise laboratory kind of thing; a type of systematic controlled observational situation under careful conditions, where you can gather some reasonable data that is subject to scrutiny in a systematic way. I think this has to be insisted upon, and then later move into the level of how to get this generally distributed and accommodated to the outside world. One of the things you learn through time is what types of things you can build into these semi-contrived situations, which have pertinence to the real world, in a fair proportion of cases, and what things are totally irrelevant. There may be all types of interesting peices of information; you can discover the progress you get under contrived conditions that just don't help them very much in most situations, but that's something you learn with experience.

Mr. Korb:

Leo, it occurred to me that, if your objective is to determine whether this should or should not be used by the Veteran's Administration, you may come up with a situation where, for certain people, it should and for others not, and for certain individuals it may be useful for certain kinds of travel and for others not. If you try to relate the successful traveller to many characteristics, you may find that even your forty cases will not come anywhere near what you need to come up with any conclusions.

Dr. Riley:

That's perfectly true.

Prof. Lukoff:

I know why you're selecting the age, but I think other considerations come in, too, I know that a lot of things being developed tend to

neglect the older blind who are the largest proportion of the blind. Also, I think the situation of the younger blind is really qualitatively different. The older person who becomes blind at 60, 70 or 80 is not going to make major accommodations to his handicap. I think most of them will probably be content with being comfortable and cozy, until we know better. One of the things that was pointed out here, and which I overheard during conversations here, is that perhaps devices like this could be taught to the young so that they could grow up with it. In effect, this may be the only group that will ever by able to fully use it. The same is true of Braille; those who grow up with Braille become proficient Braille users for the most part. It might be a similar situation with a device like this, that only those who start in very young - it becomes a part of them, in a sense. Those who become blind later in life are more apt to remain with the cane or the dog. I'm not saying this is necessarily true, but it might very well be like that and it would still be very sueful. Just because it doesn't help all the blind doesn't make it not worth while.

John Dupress:

Any questions or comments?

Well, I'll deal briefly with what the group at St. Dunstan's proposes to do as of April (they should be starting just about now). The principal investigator in the area of evaluation projects is Dr. Edward Eliot, head of the Applied Psychology Research Unit, Admiralty Research Laboratories. He's adding this job at St. Dunstan's to his previous experience.

There is at least one major difference between the blind population in England and the United States and that is there are very few p ple in England who have had any formal evaluation or mobility training. The Royal National Institute for the Blind Center gives a certain amount of cane training. A few to no subjects will be used because there are so few of they to get hold of. Therefore, the majority of blind people in England, in this evaluation procedure, will come to their mobility - whatever it may be - largely by their own means, without going through a formal training program. In the United States it's fairly easy to find - out of a population of several thousand - people who have had some kind of formal mobility training either in or out of the Veterans group.

Dr. Eliot's group is starting off with a self-trained population. Before they started, they did a physical analysis of the device; one of the divisions at the National Physical Laboratory studied exactly what the device did, what its field of view was, how uniform is its linear sweep, etc. They also compared samples in the production line and got some idea of the differences in performance from one device to another. They plan to start the evaluation program by sorting out one major area from all others. That is, you can think of mobility as object detection. (Sometimes it's object avoidance; you're monitoring the open path and just want to avoid the object. Sometimes you want to recognize them for orientation purposes.) Anyway, there are objects, terrain changes and dynamic situations as you're moving along. You have to orient yourself to know where you are from time to time,

to assist you in navigating from the palce you started out at to the place you're going to. You should train the person in what is called a stoned hand approach, and the situation should be a simple as possible. In this case the object is stationary and the subject is stationary. The subject has the device and is trying first to detect the presence of an object, or a variety of objects, and the tells you, with some precision, where the objects are. The subject knows he's pointing the device in a certain direction, so now you try to get him to replicate that. Then, you take him to the point where he has some idea of how far away the object is. In this way he gets to recognize certain types of objects because you have gross differences in a small population of objects. Multiple objects are introduced and, thus, you build this familiarity with the characteristics of the devices, as well as sensing capabilities, the subject's processing ability, etc.

The next thing you want him to do is to move about with the device, while the object remains station . The subject will be moved through a maze, but you don't want to clutter up the problem by his having to find his way through the maze. I think this is where Eliot is kind of shrewd, because all the controlled experimental people have really mixed up object detection avoidance with maze navigation. I really think this is a big goof and the Americans have done it consistently.

Eliot is going to try to avoid this by letting the people follow a guided path; that is, if they have a second hand and they can follow the guide rail. They're not concerned with where to turn when they come to the corner, because they just follow the rail around. All they're concerned with is the object detector. They move now so they can bump into them.

Beyond this, they're going to concentrate on a real-life situation, as they'll observe their blind population of subjects travelling about their home environment, from their home to places of interest to them, or to work, etc. They're going to try to sort out from their mobility situation: first, familiarize themselves with how mobile a person is, how he handles the situation with his previous method (invariably a cane) and then they'll find out how well they do, what's causing problems, what doesn't seem to, etc. Eventually, they will instrument them with the device and see what changes there are, if any, in their performance with the device - with or without the cane. That is, the device without the cane, the cane without the device, and then the cane and the device. One point he made was that it's going to be fairly difficult to motivate somebody long enough to keep him with us, in order to find out what little we're going to find out. So, we've got to motivate them by giving them some interesting games to play or perhaps always getting them to find out some interesting aspects of their environment. Of course, we don't know how to weigh, correlate, or know the significance of anything, but we're going to let them play some of these games because it appears to make them happy and contented and, thus, eager to do more.

Dr. Eliot is keenly aware of the necessity for motivating subjects, even though the things you get them to do may eat up valuable staff and subject hours and may, in turn, not produce neat data. But, at least you keep the subject with you long enough to get to the end of the evaluation.

The team in this case consists of a psychologist (like Eliot)as the principal investigator, a full-time engineer with some psychology background, a couple of training officers and then the back-up from the people in the autonomics division who do whatever is required in instrumentation. They're going to monitor (or telemeter) performance with miniature transmitters by photographic means, or whatever is necessary to pick up all the relevant information. Later on, they'll try to send it out in the pursuit of their evaluation.

The timing of this evaluation seems quite good, since the National Physical Laboratory and the American Center for Research in Blindness and Rehabilitation are about to undertake an evaluation of the Kay device. With all this information being swapped back and forth, we hope to get going with some so-called evaluation research in the Fall. I'd like to think that some of the rest of you will be continuing to evaluate the ultrasonic device of Kay's and the near infra-red device of Benhan and Benjamin. We can pool our knowledge in a more concrete, systematic fashion than has been evidenced heretofore.

The next item on the agenda is what some of the technologists here present propose to do, based upon what their experience has been with the devices they've worked with and, to a certain extent, what useful information they have gathered by looking at other people's devices and other people's evaluations. We'll go around the table and the first person who is working on any type of device can start off.

Mrs. Riley:

We have two instruments at Perkins and, hopefully, next year are going to try and work out a schedule where we can spend more time with some of the students on these devices. Also, we're going to try to find some students who have completed the course and who have academic time available, so we can conduct a complete course with the aids throughout the year to see if progress can be made to a substantial degree and if the students will become satisfied with these devices as travel aids. This is, more or less, just experimental, but we hope to put more time into it from the beginning of the year to the end.

Howard Freiberger:

Last week I heard orders being transmitted to our shop and mechanical engineering design people to look into the cane problem. After they digest everyone else's cane ideas, not the canes, they're going to try to come up with a collapsible cane. The Veterans Administration, as people

were saying, are not that concerned with providing, but we think it isn't a bad idea to have a collapsible cane. At least this is the only area, intramurally within the VA, I think, where such technological work may be going forward. For the most part, our contractors are doing the other items.

Russ Williams still has his own long cane which came, recently, to a semi-standardized form with specifications published in a booklet form with a drawing of the cane. This is available to anyone who may be interested. It's a nylon-tipped, Scotch-like covered cane with a small crook on one end and a flattened golf grip on one side for use in what he considers the best technique of long cane use.

John Dupress:

Isn't that known in radical circles as the typhlocane?

Howard Freiberger:

It is so-called on the cover of the bulletin - typhlocane. The idea was tossed around to call it typhlostaff and anything but a cane. Somehow, it became typhlocane - blind man's cane.

Mr. Benjamin:

At Bionic Instruments, we took a look at what came out of the Tracor evaluation of the G-5. Our own private thinking pretty well conformed to this evaluation which seemed to say that the device, which was an obstacle detector but which took up the hand so that you couldn't very conveniently carry a cane at the same time, was less than satisfactory. The problem was that, if it wouldn't detect curbs at the same time, it wouldn't give a great deal of information about range, and then you'd be forced to choose between a cane and a gadget that you carry in your hand. If you've got to make this choice, and don't have both, then you almost always choose the cane. So, would it make sense then, at the next step in evolution, to try to see if we can boil down everything that was in a box (as we saw, 3" x 7" deep for 7" high) into the barrel of the cane, so that we could make an obstacle detector that would be in the form of a modified cane. It wouldn't be as good as a Swail cane or a one-day VA cane, but it would be something in a cane configuration. This way, it could be used for detecting curbs as well as obstacles, so that when the electronics fails at least you've still got a cane at the end of it all.

In the last year or so we have set about to do just exactly that, and we think we are nearing completion of the very first model of such a thing. It will have three separate elements. One element will be an obstacle detector that will look straight ahead out to a setable range. With a setable range that goes from in close out to any distance that you set, which is done by turning a little thumb wheel that can be set anywhere between 10 feet and say 3 or 4 feet, it will pick up anything from right on top of you

out to that particular spot and indicate this by the tactile stimulator in the handle. The second channel looks down at the ground, so that it hits the ground 6 feet away from the walker, when he's holding the cane at the conventional angle. While this probably will not detect curbs (it's not meant to detect curbs, at least to start with), it will at least tell when you're getting to the edge of something, so that you don't fall into an open manhole or over the edge of a train or subway platform. The third channel will look up at such an angle that it will cover the region of the traveller's head and shoulders in a somewhat similar way to the ultrasonic device we were looking at a few minutes ago. It will come to a focus six feet out and six feet above the ground so that if there is something overhanging it will catch that.

The only way we've been able to boil it down is by using a galley light, arson-like lasers, and other micro-miniature circuit components to cram all this stuff into a cane without having it get too big. I could run on to considerable lengths describing it, but I don't think I should take more time.

John Dupress:

Do you have any idea about how much weight it's going to add to the whole thing - roughly?

Mr. Benjamin:

We hope it will end up weighing only a couple of pounds. That's everything, including the cane itself. We're trying to keep the center of gravity somewhere near palatable, by putting the batteries, which are the heaviest part, up in the crook of the cane. I'd like to repeat that it's not our idea of Bionics' gift to the world of the cane. It's going to be crude from the point of view of the cane. We're doing the best we can to make it no worse than we have to make it, but it's going to be a compromise between a guidance device on the one hand and a cane on the other. So, it won't feel as pleasant in the hand as a regular cane would, but it will certainly be a lot better than the device without a cane. It's this sort of a compromise. There will be nothing but ordinary aluminum cane material below the first couple of feet. In other words, about 1-1/2 feet to two feet below the crook will contain all the electronics and the object detector and below that it's just plain cane so that a moment of inertia, I think, should be somewhat near where it ought to be.

_____:

So that it will have some maneuverability?

Mr. Benjamin:

Yes. I don't want to paint the picture too black. Also, I don't want to pretent that we are simply stuffing a guidance device into a cane and nobody will know that it's any different from a regular cane, because

it's not that good.

I might say in passing that the little flashlight unit you were looking at this morning was not meant to be a practical obstacle detector, because it doesn't have ranging. We know that it's not likely that it would be practical in itself. We did this along the way as sort of a study model as to how much we can boil down components as a step toward trying to turn something to see whether we could get enough stuff crammed into the shape of a cane to make it work. The first step is to see if we can get it down to at least the size of a flashlight.

Lindsay Russell:

Well, I have three things planned for the ultrasonic detector. One is the hope to make a small quantity of these and put them in the hands of some cane travellers who are required in their daily travel to take something like an hour's subway travel or railroad travel - something on that idea. Where this device complements the cane, the idea had been that the cane traveller is on a plateuu of sorts. What we want to do is have them move on up rather than go down and start some different route. With that philosophy, it doesn't seem like a bad idea to put a few of these in the hands of people and just let them go ahead and use them in their travels and later see what happens. The second thing that's resulted from my study of John's travel through MIT, when he'd "shoot the rapids" from time to time, had been to make a binaural device. What seems to emerge from this business has been that, if you see a person walking through a crowd and he avoids everything in his path, the instrument must be giving him cues from which he can make travel decisions. Range, only, doesn't seem to be quite enough; somebody cuts across his path, walks out of a door. If he can have some little azimuth history so he can tell whether he should veer left or right, is the thing clearing spontaneously so I can keep going, it might enhance the thing terrifically. The binaural device is just like the monaural. You wouldn't know the difference, if you used the binaural, except that the sound, instead of coming from dead in the center of your chest, will come from the right or from the center or from the left, depending on where the object is to the beam of the device. The third thing is,for a year I've had an attachment to this which regulates the volume up and down automatically, which consists of this little hearing aid microphone, 12 transistors and some circuitry which monitors the ambient noise level. This does several things. One is it reduces potential embarrassment to the user by having the volume too loud when he's in a quiet place. The other thing is that it makes more frugal use of the hearing channel. We haven't tried it, because amplitude is not _____ _____ dimension range. We hope to give this a try within a few months.

Murray Burnstine:

The method we're going to use next week is to have several observers out on the MIT athletic field, on which we've marked a chalk grid, in order to/simultaneously record at various intervals the position of the men using straight-line

travel devices. We realize this is a crude approach, but we'd like to get started to have some feel of what these devices do.

The course we've set up is 100 feet of straight travel and we're allowing a 20-foot deviation right or left. We won't have any problems at night, because we've worked out a photographic technique using a flashing light on the subject's head which gives us a time base for this street photography technique. It gives a very nice display of where he's been and where he's going and how long it took him, just by counting the dots out from where he started.

We haven't tried any sophisticated methods to do this in the daytime, i.e., we haven't tried tailoring the film to a filter and a special radiation source - say infra-red flashing light - and, for daytime use, we've been working on various manual tracking devices. In other words, keep the band centered in the cross-hairs and drive an X-Y recorder electrically to tell you where he is. Lindsay Russell is working on an artillery ranging-type device. Roughly, the man here would carry some untrasonic sound source and there would be microphones placed on the field, and the time delay - this pulse reaching each microphone - would let us know where he is.

There are some students working on tracking devices projects. One project involves a government surplus star tracking device; a navigation aid which locks on a star and stays there, so to speak. It follows the subject and gives some display on where he is. One of the students has developed a daytime photographic tracking technique. It may work on a cloudy day when he uses a long cardboard tube in front of the camera, so that the man, only, essentially is in the field. You don't get all the background burning out the film. You have your subject wearing a cap on his head, or a shirt or vest which is at the spectoral peak of the films - a yellow or light blue vest which, against the green grass of the athletic field, may or may not give you a streak, depending on how light it is outside.

Howard Freiberger:

You mean the shutter is open?

Murray Burnstine:

All the time.

Now, at the lab we try to see what each straight-line mobility device will do in its own environment. For instance, Jim Swail's radio direction finder; in a radio-free area, non-electrical field, what will this thing do as we traverse in azimuth about every 10°? What is the frequency this thing is putting out? What kind of a polar plot do we get? What are the rates of changes for a distant station, a near station, daytime, nighttime? We've encountered some fairly complex problems in seeing what the device was doing at the lab.

We've done the same thing with the Swedish compass. It's a little simpler; all we have to calculate here is the dead band - how much can you move the thing before we get a signal? What angle does the compass with the tactile output look at you? How much can you deviate before you get a signal?

The student version of the 19-ounce gyroscope is not working, but is being redeveloped. We plan to design and build two units for evaluation.

We have about four miles of collapsible canes and it's boiled down, essentially, to a materials search. Light-weight materials which will hold up, which have corrosion resistance and some bearing ability if sand or mud get in the joints, some cables, etc.

John Mendelson:

Well, as they say at political conventions, the great Golden State of California passes, except to say that, as I told a few of the participants present earlier today, I had casual and fleeting exposure to the Santa Rita Technology device which seems to be rather exciting. It's purely a tactile device which gives the signal across the entire palm of the hand, as it's held, rather than in one given finger tip spot.

Professor Benham:

Well, I'll say a word more about what Mr. Benjamin said. We'll finish the cane and make some sort of evaluation of it and then, as a result of that, make recommendations to the VA as to whether we should make another or two or three, or what we should do with it. In the meantime, we'll think in terms of other configurations of devices that might be worth trying and then also keep in mind at all times the fact that there are two or three areas in which we need a "scientific break-through." One of the areas is the power source - the battery supply. We need some kind of a supply that doesn't take up so much room in weight as the present battery supply does. But, we may have to mark time and wait until the 50 billion defense system works it out for us, because fuel cells, or atomic power, or some sort of thing like that someday may turn up in a very nice small package. Then, again, there's a possibility that somebody will find a way to utilize the energy in the human body to drive the system without a major surgery job being done. They've already been able to implant a device in the intestines that will get something like 4 or 5 watts of available electric power for driving internal artifical organs. These are way out ideas, but we've got to keep thinking about them because they are what some of the stumbling blocks are. Another stumbling block, in the case of our device, is the light source. We were using a larsonite laser which is pretty good. RCA has a better one, but they won't let us have it. Well, they'll let us have it, but they want $20,000 for just one. We don't feel that we ought to ask the VA's limited budget to help support RCA to that extent, so we have to try to get it out of them some other way. And then, the stimulator problem is - I don't like it yet. We have a number of different kinds of stimulators, but I don't like any of them yet.

John Dupress:

How about bimorphs?

Professor Benham:

Well, we've tried them but we haven't worked out anything that I would consider satisfactory.

Mr. Benjamin:

We burned out the last three trying to get enough power out of them to do something.

Professor Benham:

They're very nice if you are going to sit quietly in one spot and concentrate on what you're doing but, if you're going to have a device that's adequate for alerting you in the midst of a lot of other harassments, such as buses that are just missing you and things of that sort, why you need something a little more drastic than that.

Jim Swail:

Well, I'm working on a folding cane project and, at present, we're continuing the development and evaluation of it. I think our major problem at the moment is cables and it looks like we're getting a solution to that.

John Dupress:

We have one through the 401st cycle and, when I go back to work, I'll take it apart another 5000 times.

Jim Swail:

It was up to 600 the other day. How did it come down 200?

John Dupress:

No, it didn't get up to 600. 401 is the figure.

Jim Swail:

This is really our major problem. We have a new tip design and a few other minor things.

John Dupress:

Well, it's weakness in the joints that has licked every other design. This doesn't have weakness in the joints.

Jim Swail:

No, and it looks like it's something that's cheap to produce if you use automatic screw machines and, in some things, different techniques.

We're continuing evaluation of the Kay device and finally, after a year's delay, going to get back at a tactile output supersonic device. What I want to make, essentially, is a supersonic compact version of the G-5. In other words, I want it to be as similar as possible, so we can evaluate it in about the same way. It looks like we'll get at that in about a month. The thing is, that Benham keeps me busy with other projects, so that I can't get at this.

Mr. Luini:

We just finished a collapsible, too, and I was wondering where we could send a few of them to get an objective opinion. I dropped one off at Boston College yesterday.

John Dupress:

When you said objective, that's where you left yourself open for trouble. Send one our way; we're in the process of doing that anyway.

Murray Burnstine:

How does it work?

Mr. Luini:

It retracts into a barrel, rather than joining into itself. It's not made of telescoping joints. What we're trying to do is take the long cane and make it half its size when not in use; not to make it small enough to put into a purse or a pocket, but make it easier to handle. It retracts within the upper barrel. The upper barrel has a slit going right up the side and the bottom barrel, which slides up into it, has a knob, and all you do is withdraw it right up to the crook and then tighten the screw and that keeps it in place. When you want to put it down again, you just untighten the screw and down it goes; it slides right in. It retracts rather than collapses.

Howard Freiberger:

That weakens the upper section to some extent doesn't it?

Mr. Luini:

Well, there's enough overlap. We've tested it just with people using it, and ....

Howard Freiberger:

What do you mean by overlap? The slot is closed, you mean?

Mr. Luini:

Where the barrels come together, the bottom part is in the upper part.

Howard Freiberger:

So that's your joint. But the whole upper section is weakened by the slot. These people bend it or something.

Mr. Luini:

The engineer says it doesn't seem to be appreciably.

The tip is nylon and preworn at an angle so that it rests on the ground. This is why the slit is important, too. When we first started we had the screwing type. We realized a person without sight couldn't tell when the tip was in the proper position, but this way you can because it's fixed. You can't retract it and change it; it's in the same position and the tip is held in by means of a screw.

Professor Benham:

Can you stop it anywhere you want on the way down?

Mr. Luini:

Yes, but at the extreme upper part and the lower part there is a hole, so that when you screw it it goes into the hole and locks it in place. You could use it at any mid-point if you wanted to. I brought it down from Rochester on the plane and just had it with me on the seat, and it wasn't much of a problem at all. It didn't attract too much attention either.

Howard Freiberger:

There's no binding in time from corrosion or other factors on the overlapping joint? That's often what happens, you know, or dirt goes in and it sticks. Then, someone forces it and it bends.

Mr. Luini:

So far, no. It slides pretty freely. There's nothing tight in there. When we get into the Mahler cane it has this type of tightening and, after a while, it gets kind of cumbersome.

_____:

What's the diameter of the tubing you use, and the gauge of the metal tubing?

Mr. Luini:

There's 1/2 inch in the lower section. I don't know the gauge. I'll send one down. Can I sent one here?

John Dupress:

Send one to the Sensory Aids Center.

Howard Freiberger:

We'll ask for one, too, when I get back.

Murray Burnstine:

How many have they made?

Mr. Luini:

We have 24. They were made, incidentally, by the son of a client who is totally bland and has a workshop in his back yard.

Mr. Mendelson:

Would you like us to put it through its paces at our orientation center?

Mr. Luini:

Yes, certainly.

I have an Advisory Committee of totally blind and partially sighted people who meet with me every month to discuss things like this, and we had them try it out, as well as some of the clients, and they seemed to like it somewhat.

Howard Freiberger:

Incidentally, if we break it, there won't be an outrageous fee will there?

Mr. Luini:

No. When you're out at an agency like that and you're fooling around with things, it's good to be able to send things to a place and get professional opinions on what you're trying to do. It's good to be able to have a place to send them to and get some opinions, because you can't usually get this in your own home town.

Murray Burnstine:

While we're talking about canes, you might be interested to know that John Dupress, based on the number of times he folded the cane up, has set the criterion of success at 5000 collapses in a cane. He thinks that's about a year's use for himself.

Jim Swail:

It's probably not unrealistic.

Howard Freiberger:

I think there's a strong male-female difference between that, don't you think? I think women like to fold them up more.

John Dupress:

Anymore questions? Well, I think we've covered the agenda. I plan to get in touch with the people who didn't come today and literally pull the data out of them. Everyone here will get a copy of the notes for additions, deletions, editorial comments, etc.

The current plan is to have this as a yearly operation. If I do enough digging and scrambling and compiling, perhaps some of the people who didn't come this year will be motivated to come next time. Each year, I would hope we would find this a useful exchange of information on the whole mobility evaluation area. Also, by next year maybe I can persuade old Lord Frazer that he should send someone over from there, because 'tis necessary to visit the Colonies from time to time, you know.

Thank you all for coming.

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